Journal of THE AMERICAN DIETETIC ASSOCIATION

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Dietitians—Supply and Demand

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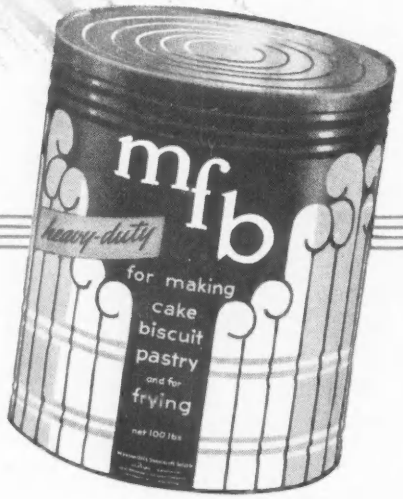

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Nutritional Problems Connected with Diabetes Mellitus[1]

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HERBERT Spencer, the English philosopher, compared the development of human knowledge with the growth of a sphere. In this sphere, the surface area represents the territory of problems yet to be solved and each advance in our knowledge adds to the radius. Thus every increase in our knowledge increases the unsolved problems by the second power.

We are inclined to accept Spencer's rather challenging simile when we review the nutritional problems at the different stages of diabetes research. After the discovery that the urine of diabetic persons contains sugar and after the recognition that dietary sugar increases the sugar excretion, the problem appeared relatively simple: the answer seemed to be to decrease the dietary sugar intake. Later, however, when a decreased function of the islands of Langerhans was recognized as a cause of disturbed sugar utilization, it was shown also that on a sugar-free diet, the danger of acidosis is menacing. In addition, it became clear that not only sugar but also excessive protein feeding may increase sugar excretion in diabetes.

Thus the dietary problems became more complicated and the aim of therapy was to develop diets to prevent or at least retard the degeneration of the islands of Langerhans and simultaneously to prevent the development of ketosis. Ingenious experiments on pancreas-extirpated animals, on phlorizin-treated dogs, and on diabetic patients have been devised to determine the optimal composition of a diet for diabetic persons. The results of these experiments undoubtedly enriched the science of intermediary metabolism but were of only little value in the practical treatment of diabetes. For the effective treatment of clinical diabetes, therefore, the future isolation of the pancreas hormone seemed for several years to be the only solution, the only hope.

Today, nearly thirty years after isolation of the hormone, we know that insulin proved to be a life-saving remedy, but so far this discovery has solved none of the nutritional problems. The isolation of insulin and the more recent discovery of pituitary and steroid diabetes added a tremendous number of new and further problems to the old questions, thus supporting Spencer's simile.

PANCREATIC OVERSTIMULATION MAY CAUSE DIABETES

The search for dietary treatment of diabetes has been and is even today too often characterized by the tendency to simplify the complicated pathologic condition to a single disturbance, to the disease of the pancreatic islands and the consequent disturbance of sugar utilization. All other symptoms are then regularly explained as derived from this single disturbance. The earliest dietary treatment, the serious restriction of sugar intake, was based also on such a concept, i.e., the assumption that the functional exhaustion of the pancreatic islands is the central damage in diabetes.

Another reason for this restriction was the belief that a persistent, increased concentration of blood glucose damages not only other organs but also the pancreas itself. This conclusion was based mainly on experiments in which an artificially induced hyperglycemia was shown to cause a hydropic degeneration of the beta cells. Often quoted are the experiments of Lukens (1) who injected into cats heroic doses of sugar for several weeks and in this way produced in some of the treated animals a persistent diabetes. These experiments really indicate that acute overstimulation of the organ by increased blood sugar may eventually lead to a functional exhaustion with consequent structural damages.

LACK OF STIMULATION CAN SPEED DEVELOPMENT OF DIABETES

These results, however, cannot be generalized, because it was shown by other authors that not only

[1] Presented before a joint meeting of the Los Angeles Diabetes Society and the Los Angeles Dietetic Association on February 28, 1952.

overstimulation but also a lack of stimulation of the pancreatic islands may facilitate the development of diabetes. For instance, in partially pancreatectomized dogs when the blood sugar is kept low by repeated insulin injections, degeneration and atrophy of the remaining islands develop (2). Houssay and Martínez (3), furthermore, were able to prevent the development of diabetes in partially pancreatectomized young rats by repeated sugar administration probably because the remaining cells were stimulated to higher activity. It has been shown also that in mild diabetes produced by pituitary injections, permanent hyperglycemia does not produce further damage (4).

Thus the animal experiments do not support the contention that rigid dietary control of the blood sugar may arrest the development of imminent or early recognized diabetes. Nevertheless, the theories in connection with the etiology of human diabetes were dominated by the dogma that the functional exhaustion of the pancreas is the chief damage, and even Banting (5) was of the opinion that the excessive ingestion of sugar is one of the main causes of diabetes. Actually, the premises on which these conclusions were and are based are evidently false.

We have seen that dietary stimulation by sugar does not always facilitate, but in fact in certain cases may prevent, the development of experimental diabetes. Even in the often quoted experiments of Lukens, hyperglycemia had to be initiated and maintained by administration of exorbitant quantities of sugar. We know, however, that in normal men, after a high-carbohydrate intake, the blood sugar shows only moderate and transitory increases. Therefore, a protracted and increased alimentary blood sugar level is in itself already one of the symptoms of disturbed sugar metabolism and cannot be identified as a cause of the disease. It may be objected that short-term animal experiments with a few weeks of sugar administration cannot be compared with a lifetime indulgence in high-carbohydrate meals.

STATISTICAL DATA AGAINST THE SUGAR THEORY

Epidemiological and nutritional surveys also disprove the validity of the sugar theory. Analysis of statistical data shows that the incidence of diabetes is lowest in countries where the diet is particularly rich in carbohydrates—for instance, in Japan and China. The Gillmans (6) even claim that the low incidence of diabetes in African Negroes may be attributable in large part to their high-carbohydrate diet. That no racial differences are responsible for the low incidence of diabetes in African Negroes has been shown by the fact that the American Negroes have a high diabetes mortality. Again, in the southern United States where the diet contains more carbohydrate, fewer Negroes suffer from diabetes than in the northern part of the country.

Most important arguments against the sugar theory are, however, the statistics collected during World Wars I and II which show definitely that with the restriction in available food the incidence of diabetes decreased considerably (7). In Austria during World War I, 85 per cent of the patients with mild diabetes showed a definite improvement; about the same was true for Germany and also for England. During World War II the history of diabetes incidence and mortality showed a repetition of the trend observed in World War I. Good statistics from Belgium show reduction of diabetes incidence by 60 per cent. France also reported a reduction during the time of severe food restrictions and a renewed increase of diabetes after food became available again.

Investigating possible reasons for the decrease in diabetes incidence during the war, we find that the consumption of the more easily available carbohydrate calories increased with a proportionate decrease of the more expensive calories from fat sources. These wartime experiences, therefore, do not at all support the causative importance of a high-carbohydrate diet. They also tend to disprove the theory advanced by some authors that a vitamin deficiency may be involved in the causation of diabetes. It is evident that the vitamin supply during the war was certainly not better, but rather worse than in peacetime.

THE FAT THEORY

The restricted war diets did, however, reduce the incidence of obesity. Since obesity is mentioned as a causal factor in the development of certain types of diabetes, the wartime reduction of diabetes incidence is often explained by decrease in obesity. We must emphasize, however, that in spite of the most impressive statistics supplied by the life insurance companies, the causative relation between diabetes and obesity has not been satisfactorily established because only about 5 per cent of the obese people develop diabetes. Diabetes and obesity may be parallel symptoms of the same basic degenerative disturbance.

Because the food consumed during the war contained relatively less fat than the peacetime diet, it was suggested that an increasing fat consumption may be responsible for the ever-growing incidence of diabetes during peacetime (8). This idea was further supported by the following facts: (a) According to case histories, the majority of diabetic patients preferred rich diets containing excessive proportions of fat before the onset of the disease. (b) Statistics show also that in the Western civilization, with increasing buying power, the consumption of fat has increased with a parallel increase in incidence of diabetes. (c) Furthermore, the urban population which consumes more fat shows also more diabetes than the rural population. Unfortunately we do not have any data on the diabetes incidence of the Eskimos, who consume diets with only 8 per cent of the calories coming

from carbohydrate and about 48 per cent from fat.

In addition to these statistical data, it was found that the sugar tolerance of normal men actually can be impaired by feeding carbohydrate-poor diets containing relatively large amounts of fat (9). In this connection Himsworth (8) warned that in individuals hereditarily predisposed, diabetes may be conceivably produced by too-serious restriction of dietary carbohydrate intake. It was assumed that the deficiency in carbohydrate stores may induce the anterior pituitary to produce diabetogenic hormone in order to increase sugar formation in the body. This protracted increase of anterior pituitary hormone production may then lead to a permanent diabetes by destruction of the islands. Relevant also is the finding of Abderhalden and Wertheimer (10) that animals kept on high-fat diets are more resistant to insulin than animals maintained on high-carbohydrate diets.

In connection with these dietary effects it was also suggested that the observed decrease of the sugar tolerance results not so much from an increase in fat but rather from the proportional decrease in the carbohydrate content of the diet. These findings, however, cannot explain the steady increase of diabetes morbidity in the past decennials, because we know from reliable statistics that in the last twenty to thirty years the carbohydrate consumption in the United States has not changed (11). The diabetes incidence, however, has steadily increased during this same period.

It seems to be likely, therefore, that the high-fat content of the opulent diets consumed by the western civilizations rather than the low-carbohydrate content may represent one important damaging factor contributing to the development of diabetes.

LIPOTROPIC DIETARY FACTORS

Another factor was suggested by the Gillmans (6) who direct attention to the work of Best in which it was demonstrated that an alipotropic diet may result in such marked inhibition of glyconeogenesis that the depancreatized dog may remain aglycosuric without insulin. The African diet is poor in lipotropic factors, and this may be another reason for the low diabetes incidence in South Africa. Attention should be called also to the fact that the incidence of diabetes is unusually high in certain districts of India, where the diet is poor in proteins and narrowly limited to rice and vegetables. It was shown there also that the sugar tolerance was lower in vegetarians than in the meat-eating population. In these cases, probably the lack of some unidentified nutritional essential may have facilitated the development of diabetes.

A further dietary factor influencing the insulin sensitivity was demonstrated by Abderhalden and Wertheimer (10), who found that a cabbage-lettuce-carrot diet increased the insulin sensitivity of rabbits while feeding an oat diet decreased it. About twenty years ago we (12) found that the sugar tolerance was much lower on the green diet than on the grain diet. The green-carrot diet has an alkaline residue equivalent to 22 ml. $\frac{N}{10}$ base, and oats represent per ounce an acid residual equivalent to 132 ml. $\frac{N}{10}$ acid. It is, therefore, probable that the differences in the alkali-acid residue of the different diets may be responsible for this specific effect, but the participation of other factors cannot yet be excluded.

All these data seem to indicate that there is no single causative dietary factor and that besides the high caloric and fat content of the diets, other factors may be responsible for the high diabetes incidence in recent years or may at least facilitate the development of diabetes in hereditarily stigmatized persons.

These relations between restricted diets and decreased incidence of diabetes are very suggestive and seem to open a promising field for further research in the dietary prevention of diabetes. The problem, however, is very complex and to date only a few factors have been disentangled. There is not enough evidence on which to base a dietary regimen simulating the wartime restricted diets as a means of preventing imminent diabetes.

THERAPY FOR DIABETES

Turning now to the nutritional problems related to alleviation of an already developed diabetes, it must be realized that we do not know whether the factors which may prevent diabetes are identical with those which tend to correct the already developed metabolic disturbances.

Investigating the role of dietary elements in control of diabetes, it has to be emphasized that although we no longer regard sugar as the exclusive "fuel of life," physiologic and pathologic experiences still prove that glucose occupies a key position in intermediary metabolism. In diabetes itself, the principal disturbance seems to be a decreased utilization of glucose and the consequent absence of certain essential links which are normally produced in the course of glucose utilization. It is yet unknown whether these links are normally developed in the pathway of sugar oxidation or in the pathway of lipogenesis of fat production from glucose. The therapeutic goal at present seems to be, therefore, to restore, or at least to improve, the utilization of glucose. Thus it is a misconception to "control" the diabetes *merely* by means of severe dietary sugar restriction—by decreasing the hyperglycemia and glycosuria. It is no better a solution to replace the sugar with isodynamic quantities of other ingredients, such as fat, because this does not restore the utilization of sugar and in diabetes, evidently, more than the calories produced normally from sugar are missing.

SUGAR AND INSULIN PRODUCTION

The old argument whether sugar utilization is disturbed in diabetes has recently been investigated by Wick *et al.* (13) who found that the oxidation of sugar is substantially decreased in eviscerated animals and restored by insulin injections. The other metabolic pathway of sugar, the transformation into fat, is also disturbed in diabetes and improved by the use of insulin, as shown by Pauls and Drury (14), Stetten and Boxer (15), and Chernick and Chaikoff (16). It has been shown by the experiments just quoted that both of the main pathways of glucose utilization, oxidation and lipogenesis, require adequate amounts of insulin. One of the main nutritional problems is, therefore, how the decreased insulin production can be corrected by dietary means.

The most powerful stimulus for insulin production is dietary sugar as has often been demonstrated by the phenomenon of alimentary hypoglycemia, by the improved tolerance after repeated sugar-load, and by the disappearance of granuli from the beta cells after glucose feeding. It has been shown also that replacement of dietary sugar by fat or the lack of sugar intake in starvation inactivates the pancreas islands (17). After a few days of starvation or after prolonged feeding of high-fat diets, decreased sugar tolerance develops. Conclusive proof of the effect of different food ingredients has been offered by Haist and collaborators (18) who found that carbohydrate feedings increase and fat diets decrease the insulin content of the pancreas. These findings were supported by those of Tejning (19) who found that carbohydrate feeding enlarged and fat feeding reduced the total amount of island tissue.

DIET COMPOSITION AFFECTS INSULIN

On the basis of all these experiments we may paraphrase a statement of Rehfuss' to read: by means of composition of the diet we can either splint the pancreas islands and set them more at rest or we can stimulate the organ to increased function. So we see that sugar increases and fat decreases insulin production.

The big problem is, however, the practical application of these findings; how far dietary stimulation of the pancreas may be carried without the danger of further damage or exhaustion of the injured organ.

Another problem is whether in the majority of *clinical cases* a decreased insulin production is really the central disturbance. It was pointed out by Mirsky (4) that at autopsy only in 5 per cent of the clinical diabetics were beta cell lesions found.[2] Therefore, before drawing any practical conclusions, some of the further effects of dietary factors should be investigated.

[2] However, cf. Bell, E. T.: The beta granules in the islets of Langerhans in diabetes mellitus. Am. J. Path. 22: 631, 1946.

It is of theoretical interest and probably also of practical importance that by changing the food composition not only is the rate of insulin production altered, but also the sugar utilization and the insulin sensitivity of the tissues themselves can be affected. So, for example, diets rich in fat decrease, while those containing predominantly carbohydrate increase insulin sensitivity. Remarkably, previous intake of sugar increases the effect not only of injected but also of endogenous insulin, i.e., of insulin produced in the body itself (20). Even more important seems to be the fact that previous sugar feeding also increases the utilization of glucose in the tissues.

This effect has been demonstrated by Bergman and Drury and is largely independent of the action of insulin (21). Related to these findings are the important investigations of MacKay *et al.* (22), Samuels (23), and others showing that the whole metabolic pattern of the tissues changes according to the previous diet. It was shown that in animals which were starved after a period of high-carbohydrate diet, the liver glycogen and blood sugar diminishes faster than in animals kept on high-fat diet before starvation.

This indicates that the glyconeogenesis, i.e., the formation of sugar from some other material, has been diminished during the high-carbohydrate diet, probably because the dietary supply of sugar made it unnecessary to produce it from other sources. Experiments with liver-extirpated animals show that the peripheral utilization of sugar also has been changed. The blood sugar of carbohydrate-fed eviscerated animals drops suddenly, while in animals kept on a high-fat diet, the blood sugar decreases more slowly. In these experiments the liver, the organ of glyconeogenesis, has been extirpated; therefore, in fat-fed animals, the decreased peripheral sugar utilization must be responsible for the delayed development of hypoglycemia.

TIME FACTOR IN CHANGING DIETARY HABITS

The experiments just discussed show the important fact that prolonged feeding of a high-fat or high-carbohydrate diet affects the tissue metabolism not only for the time during which dietary fat or dietary carbohydrate is available in excess, but that the effect of the diet persists. This means that a "continuous change of metabolism" occurs.

These experiments should be also a warning that effects of short-term feeding should never be the basis of diabetes therapy. *It takes time to readjust the metabolism to dietary changes.* It is most important to realize that the tissues of animals held previously on a high-fat diet acquire preference for oxidation of non-carbohydrates, such as fat. This preferential utilization of fat proves that fat does not have to be transformed to carbohydrate before its catabolism in the tissues and that fat does not have to burn in the odious flame of sugar. Fat is a perfectly respectable and legal fuel of itself which is used preferen-

tially when sugar utilization is depressed or when the tissues are tuned to it by the previous fat diet. The intermediary products of fat utilization, the ketone bodies such as aceto-acetate and β-hydroxybutyric acid, represent, in fact, an easily combustible "quick fuel" (MacKay [24]) whenever the glucose supply is curtailed, as shown by recent experiments of Chaikoff and Soskin (25).

HORMONAL REACTIONS MODIFIED BY DIET

It would most probably be futile to speculate concerning the mechanism by which the metabolic pattern of the tissues is influenced by previous diet. It seems, however, important to indicate that in addition to the direct effect on the tissues, extrapancreatic hormonal factors may also be involved. It is probably not the pituitary by itself as suggested by Himsworth (26), but the hormonal reactions generally which are modified by high-carbohydrate or high-fat diets. Kinsell *et al.* (27) found, *e.g.*, that a high-fat diet prevents development of moon-face, acne, dizziness, and weakness and of symptoms of pseudo-Cushing which follow protracted ACTH treatment. The urinary excretion of keto-steroids was also markedly reduced on a fat diet. We see from the just discussed evidence that the high-carbohydrate intake not only enhances the endogenous insulin production but increases also the capacity of the tissues themselves to utilize more sugar.

In addition to changing the composition of the diet, another way to improve the sugar utilization seems to be *the proper timing of sugar feeding*. The ability of the body to utilize sugar follows a diurnal cycle which has also been demonstrated after total pancreas extirpation and is, therefore, independent of diurnal variations in the insulin production (28). It may, therefore, be advisable to determine in patients the individual daily profile of the curve and then adjust the timing of sugar intake accordingly.

We have discussed so far the influence of the main dietary components on sugar utilization by comparing the effect of high-carbohydrate and high-fat diets, as well as starvation. We have not discussed changes in the protein intake because it seems to be a fundamental nutritional rule that the diabetic organism must be provided with the proper amounts of nutritional essentials in order to maintain relatively optimal metabolic conditions. Therefore, the protein allowance cannot be curtailed. On the other hand, an excessive protein intake seems to be not only impractical but also of no therapeutic value in diabetes. In the discussion of the fat and carbohydrate effects we feel, however, guilty of some unwarranted generalizations.

The experiments of Martínez (29) show clearly that fats of different origin, such as lard, ox fat, margarine, butter, or olive oil, have quite different effects on experimental diabetes.

FRUCTOSE VS. GLUCOSE

As for the carbohydrates, it was shown already by Minkowski and by the school of von Noorden that the utilization of fructose is different from that of the stereo isomer glucose (30). These authors actually suggested that diabetics can utilize fructose better than glucose, and for this reason the dietary replacement of glucose by fructose has been repeatedly considered. Briefly, the fundamental differences in the utilization of fructose and glucose seem to be the following (31): Fructose does not increase insulin production and, vice versa, insulin does not affect fructose utilization. Fructose is, therefore, utilized by diabetic animals to the same degree as by normals. Experiments of Baker, Chaikoff, and Schusdek (32) with diabetic liver slices showed in fact that fructose feeding restores the disturbed fat formation from acetate nearly as well as the injection of insulin.

A further important point is that although fructose phosphorylation in the liver occurs about ten times as rapidly as that of glucose, the hepatectomized animals or isolated tissues, which utilize glucose, cannot metabolize fructose in appreciable quantities. This shows that fructose must be primed in the liver, probably by phosphorylation, before its utilization in the tissues. Unfortunately, we do not have information as to whether protracted fructose intake increases or decreases the utilization of glucose in the peripheral tissues. We also lack information on the problem of whether fructose utilization follows the same metabolic pathways as that of glucose. This question is particularly complicated because one part of the dietary fructose is transformed either by isomerization or via lactic acid cycle to glucose.

LEVULOSE UTILIZATION

The main issue, viz., the problem of the effect of fructose feeding in clinical diabetes, has unfortunately been rarely investigated, probably because of the high price and the difficult availability of the pure substance in adequate quantities. The circumstance that the carbohydrates of our diet contain large amounts of fructose seem to make a more thorough investigation highly desirable. The problem of whether levulose is better utilized in clinical diabetes than glucose, as claimed by earlier clinicians, is today again controversial. In this connection the experience of Joslin *et al.* (33) seems to be interesting. He found out that at first fructose seemed to be well utilized in diabetic persons, but that gradually more and more glycosuria ensued and eventually no advantage of fructose over glucose could be observed.

SUMMARY

We have discussed the nutritional problems in the prevention and dietary management of diabetes. We have seen that in prevention, the exhaustion theory, i.e., the deleterious effect of a high-carbohydrate diet on the pancreas, can be ruled out as a causative factor

in human diabetes. It seems, rather, that the high caloric and fat content of the diet consumed by the western civilizations may be at least conditioning factors which are partially responsible for the increased incidence of diabetes. Whether the chronic ingestion of high-fat diets acts primarily by depression of the islands of Langerhans needs to be further investigated. It should be emphasized again that the participation of some other dietary factors cannot be ruled out at present.

In connection with already-developed diabetes, we emphasized that the main therapeutic goal seems to be to restore to normal or at least to improve the utilization of glucose. This can be achieved first by dietary means designed to enhance endogenous insulin production. Sugar utilization itself in the tissues can be improved either by administration of insulin or by a proper sugar content of the diet. It can be influenced probably also by the timing of the sugar feeding so that the sugar supply does not exceed the ability of the tissues to utilize it.

It is needless to point out that clinical diabetes is of multiple origin and that all the dietary problems discussed so far can be applied to the different forms only "mutatis mutandis," i.e., with due alteration of the details. It seems also to be self-evident that the effect of dietary fats of different origin, the utilization of fructose, and also the effect of other food ingredients not discussed here must be more closely investigated.

The nutritional problems in the prevention of such degenerative diseases which are usually associated with diabetes were purposely not discussed. These problems are so closely connected with the pathogenesis of arteriosclerosis and with the problem of the blood lipids that we did not dare to enter on these slippery grounds on this occasion.

Neither should this review be construed as justification of unrestricted free dieting in clinical diabetes. The damaging effects of high caloric intake and of excessive carbohydrate supply are beyond the scope of this paper.

Finally, this survey shows that at the present stage of our knowledge, nothing important can be added to the excellent dietary scheme developed by the American Diabetes Association, The American Dietetic Association, and the Diabetes Section, U. S. Public Health Service (34).

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Employee Training Techniques

Training personnel was discussed by Mary M. Griffin, Supervisor of Home Economics in Charge of Cafeterias, Newark Board of Education, speaking before the Connecticut Dietetic Association on April 23. The following are excerpts from her talk:

"Features that we have found essential in our program to achieve 'our way' are:

"1. *Democratic Planning.* Programs are planned by the managers after they have consulted with their employees. They learn the needs of the employees as well as those who are able to participate.

"2. *Employee Participation.* Participation by employees is a keynote to a successful program. Perhaps the demonstration isn't as professional as that done by a professional person, but it is an employee showing her co-workers how to do a job correctly. It gives recognition to the demonstrator; she grows in her job and reaps personal satisfaction. The manager, who has trained her to do the demonstration and often is responsible for the narrating, has grown likewise. Our employees do all the food demonstration as well as the methods of cleaning the equipment.

"Dramatizing rating sheets with skits was an effective way to have all employees more fully understand some terms such as 'cooperativeness,' 'loyalty,' 'alertness.'

"Discussion groups have been worth while and allow for growth through employees expressing themselves and thinking through problems. This is a slow process even at the professional level, so we must be patient and accept little progress with an employee group.

"The supervisor finds that as the groups have been able to take on more responsibility for programs, she has become a 'prop manager,' making arrangements for space, transfer of equipment, duplicated materials, and other physical aspects of the program, and later correlating the total program and evaluating it. In terms of growth of staff members, this is as it should be.

"3. *Varied Programs.* Variety lends interest to any program. In addition to demonstrations, we use such visual aids as movies and posters. Perhaps the most effective visual aid is the food itself. We show it at all stages of production—weighing ingredients, each method of procedure, sealing, and the finished product. We display plate lunches to point up standard servings and plate arrangement.

"'Be Penny Wise and Save Dollars' rated high as a visual aid. The speaker had as her props a garbage can, a dollar's worth of pennies, and a list of priced items such as: outside leaves of lettuce, 10 cents; excess soap powder, 2 cents; broken cookie, 3 cents; and extra beverage taken with lunch, 6 cents. As she read the list, she dropped the pennies into the can. Everyone was made conscious of careless waste.

"4. *Incorporation of Nutrition, Safety, and Sanitation.* In each food demonstration, we try to put in a plug for nutrition—the 'why' of using the procedure we are demonstrating, as it affects the nutritional content of the food. We also point out a safety precaution, simple as it may be, such as 'Two persons must lift the large mixing bowls.' If possible, a sanitation rule is stressed, also.

"5. *Serving and Tasting of Food.* Serving the food which is demonstrated is a 'must' to develop an appreciation of quality food and good food service.

"6. *Use of Experts.* Representatives from the Wheat Flour Institute, Standard Brands, American Meat Institute, and other organizations have given valuable assistance and programs."

Dietary Techniques for Metabolic Balance Studies[1]

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In recent years the use of the metabolic balance method as a means of investigating the physiologic and therapeutic properties of drugs and hormones and the mechanisms of disease processes has greatly increased. It is the purpose of this paper to present briefly the principles involved in such investigations and to describe the dietary techniques employed in the Metabolism Unit of the Mayo Foundation and Mayo Clinic at St. Marys Hospital.

The healthy, full-grown human being, when eating an adequate diet, maintains equilibrium or balance of certain elements, such as nitrogen, carbon and sulphur, minerals, electrolytes, and water. This means that over a period, the amount of each of these substances entering the body is equaled by the amount which leaves the body. These balances are disturbed, temporarily or for long periods, by a number of different influences, such as changes in food intake, changes in physical activity, pregnancy, disease states, and the administration of certain drugs and hormones. A balance is said to be positive when the intake exceeds the output and negative when the intake is less than the output.

Changes in the balances of potassium, sodium, and chloride in a study of the metabolic effects of corticotropin (ACTH) and cortisone are illustrated in Figure 1.

By controlling, that is, keeping constant, all possible influences which might disturb a balance and by varying or leaving uncontrolled only the one factor under investigation, it is possible by the balance method to study many aspects of the metabolism of the human organism in health and disease. The same general methods of investigation may be applied to such substances as fat (2, 3) or vitamins (4). The term "balance," however, is not strictly applicable to such substances, because they undergo metabolic changes in the body and the amount excreted as such rarely, if ever, equals the intake.

The essential feature of a balance study is precise control and measurement of intake (food and liquid) and output (in urine, feces, and sometimes sweat) of the substance being investigated. In a metabolic balance study, small changes in metabolism are usually being sought rather than gross changes in the state of nutrition. As a rule, metabolic balance studies follow one of two general plans (5): (a) the findings for one person are compared with those for another on the same regimen, or (b) the findings for one person on a particular regimen are compared with the findings for the same person on a regimen which has been significantly altered in only one respect.

As might be surmised from the foregoing statements, the dietary techniques for a metabolic balance study require considerable precision. Such factors as the objectives of the study, choice and number of patients, duration of study, and available equipment and storage space for food influence the techniques used. As DuBois (6) has emphasized, errors can be minimized by the use of a unit or ward which has its own kitchen and nursing station and which is separated from routine hospital functions and operated by its own specially trained dietetic and nursing staffs under the supervision of physicians. Because of the necessity for extreme accuracy, it is questionable whether more than three to five detailed and extensive balance studies should be undertaken concurrently in the same metabolism unit and by the same laboratory.

PRINCIPLES USED IN PLANNING THE DIET

In general, the diet to be used for a balance study should be nutritionally adequate in all respects, unless the problem under investigation requires that the diet be deficient in one or more constituents (5). Some of the factors which must be considered when the diet is planned are:

Nature of the Problem. The diets for each study must be individually planned to meet the requirements of the particular investigation. Thus, small changes in calcium balance are most readily demonstrated when the intake of calcium is low (7). On the

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other hand, if a markedly positive balance were anticipated, this could be demonstrated only by the use of a higher intake of calcium. In some instances, the diets for different persons for the same balance study may not be identical in composition. For example, the diets used in the study of physiologic effects of cortisone and corticotropin (ACTH) as reported by Sprague and associates (1) were nutritionally adequate with sufficient calories to maintain weight. Since the patients of these studies differed in sex, age, height, and physical activity, and therefore in nutritional requirements, each diet differed somewhat in content of carbohydrate, protein, and fat. On the other hand, the diets used by Wollaeger and co-workers (3) in determining the effect of resection of the head of the pancreas on the efficiency of the gastrointestinal tract were standard test diets which were identical for all patients studied.

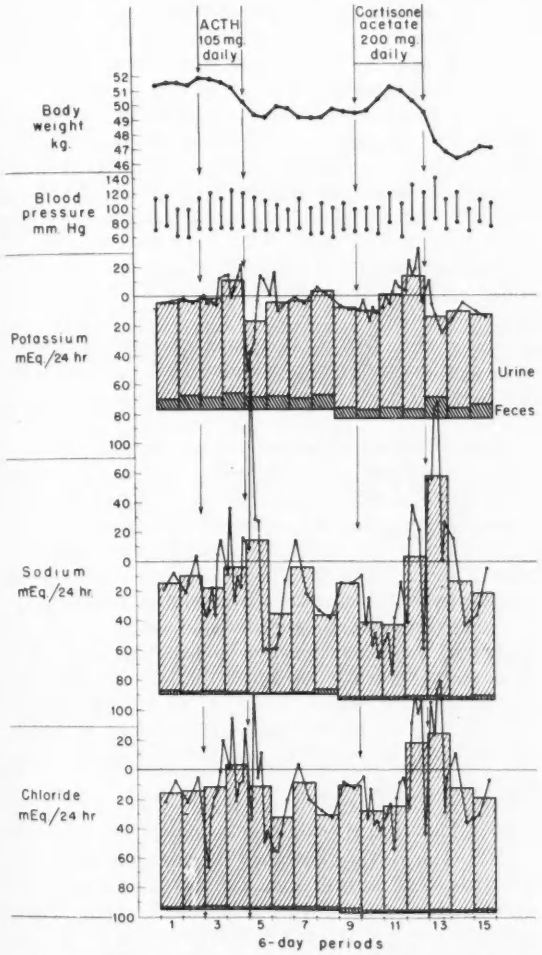

FIG. 1. *Balance data for potassium, sodium, and chloride obtained in a study of the metabolic effects of corticotropin (ACTH) and cortisone acetate. Daily intake is charted from the 0 line downward, and average daily excretion (urine above, feces below) from the bottom line upward. A negative balance is, therefore, indicated by extension of the column above the 0 line. A positive balance is indicated by a clear area below the 0 line. Since the urinary excretion of potassium, sodium, and chloride sometimes varied widely from day to day within a single six-day period, the figures for daily urinary excretion are shown in some instances and in others the mean values for three days are used. (From Sprague* et al. *[1])*

Suitability of Foods for Balance Study. Foods must be selected which will undergo minimal change in composition during preparation, storage, and weighing. Foods which cannot be stored in sufficient quantities to meet the requirements of the entire study, such as fresh vegetables, should be selected from among the foods which will be available throughout the duration of the study and which are known to be of uniform composition.

Standardization of All Dietetic Procedures. The preparation, storage, cooking, and serving of each item of food must be carried out in the same manner throughout the study.

Patients' Eating Habits. This type of study cannot be carried out effectively if the patient has a poor appetite or dislikes too many foods. Other factors which may influence the planning of a diet include age, religion, nationality, dental repair, and chronic gastrointestinal ailments (such as sprue, peptic ulcer, or chronic ulcerative colitis).

Caloric Requirements. This depends on the basal metabolism and estimated activity as well as on whether it is desired that weight should be maintained, gained, or lost.

With these factors in mind, the dietitian plans the diet for each patient individually unless the investigation calls for the same diet for all patients. In prolonged studies, in order to provide variety, three daily menus which are similar in composition are used in regular rotation. Thus, in a study which consists of a series of six-day periods, each menu is employed twice in each period. Once a diet is planned, the final determination of its composition is made by chemical analysis.

The patient receives careful instructions in the technique and purpose of the study before it is started. To permit him to adjust himself to the dietary regimen and to ascertain the suitability of the foods to his tastes, a trial period of several days to a week, or even longer, on the diet precedes the study. During the trial period, the dietitian has an opportunity to make minor alterations in the diet. Since a study may last as long as a year, it is important that the patient be content with his diet. He is instructed to eat all food that is served, because the success of the study depends on it. The times at which meals are served are kept constant from day to day.

STORAGE OF FOOD

Except for fresh foods, such as lettuce, milk, and so forth, a supply of all foods is obtained, each from a single source, and stored in quantities sufficient

for the entire duration of the study. A relatively large storage and freezing space (approximately 5 cu. ft. freezing space per patient) is essential. Meat is stored frozen in airtight packages employing standard freezing paper and methods. An effort is made to have each kind of canned goods from one case, and the number of cans which will be needed for each patient is estimated and stored. Fresh vegetables and fruits are stored in a refrigerator in as large quantities as practicable.

WEIGHING FOOD

A torsion balance which is accurate to 0.1 gm. is used for weighing food. Each item of food is weighed in the dish in which it is cooked and served or else on a piece of waxed paper.

SELECTION AND PREPARATION OF FOODS

The procedures employed are essentially those described by Reifenstein, Albright, and Wells (5), with minor modifications.

Meats. Meats for the entire balance study are weighed into servings without fat, bone, or gristle; wrapped; and frozen raw at the beginning of the study. Each serving of meat is cooked in a separate pan for each patient. It may be broiled without added fat, fried in a portion of the allowance of butter for the day, or braised in part of the allowance of butter and some distilled water.

When possible, meats are served in the dish or pan in which they are cooked. If this is not possible, care must be taken to transfer every particle to the serving dish. After the meat is removed from the pan to the plate, a small amount of distilled water is added to the pan as an aid in removing any juice or meat that may be adhering to the surface of the pan. This is then poured over the meat and serves as gravy.

Tenderloin steak, ground lean round steak, veal cutlet, and pork tenderloin are the only meats used. Most other kinds of meat, such as chicken or fish, either contain too much fat or introduce too much variation into the diet. For each study, it is desirable that all of a given cut of meat come from the same animal. For example, if steak is on one of the three daily menus, the steak used each third day should be from the same animal.

Potatoes. Potatoes are weighed raw, as are all foods which are to be cooked. They are either boiled in distilled water or steamed in a casserole placed in a pressure cooker. Any water that has not evaporated is served with the potatoes. To prevent loss of minerals, nothing is discarded after the food is weighed.

Canned and Fresh Vegetables. Canned vegetables are drained and weighed without liquid. They are then placed in casseroles and steamed in a deep well cooker. The casserole dishes are either Pyrex glass or highly glazed pottery with lids that fit snugly over, but not into the dish, in order to exclude excessive moisture. Unsalted canned vegetables are used routinely.

Fresh vegetables, other than potatoes, are cooked and served in casserole dishes. The vegetables are washed in distilled water and dried with a towel before weighing. They are either steamed in a deep well or in a pressure cooker.

Canned and Fresh Fruits. Only the edible portion of canned fruits, without the juice, and of fresh fruits is weighed. Fruits which are canned without the addition of sugar are used.

Frozen concentrated orange juice, without added sugar, accurately diluted with distilled water, is used. This is obtained by the case and is considered to be more constant in composition than juice prepared daily from fresh oranges.

Bread. Bread may be salted or unsalted, depending on the diet. Standard sliced bakery bread from the same source is used throughout the study. The amount for each serving of the entire study is weighed separately; wrapped and sealed in Cellophane; and frozen until used. The bread, except for toast at breakfast, is served to the patient in the sealed package. This procedure prevents drying and loss of crumbs.

Coffee and Tea. Coffee and tea are prepared with distilled water in a standardized manner. The quantity to be served is measured with a graduated cylinder.

Dairy Products. Unsalted butter is used routinely. The daily allotment is weighed on waxed paper and is then divided into three portions, one for each meal. These portions are kept in the refrigerator on a plate marked with the patient's name. If any butter is used in the cooking of eggs or meat it is taken from this source. The remainder is served at meals.

Eggs of uniform size are used and are not weighed. They may be soft or hard cooked in distilled water, or scrambled with a portion of the butter. Eggs are not poached in water; however, an individual egg poacher which functions as a double boiler, in which the egg does not come in contact with water, may be used.

Homogenized milk or skimmed milk is routinely used and is weighed into the glass in which it is served.

Salt. The day's allowance of salt (Baker's analyzed) is weighed into a shaker and the patient uses all of it during his three meals, thereby eliminating losses incident to the use of salt in cooking. The patient is carefully instructed to avoid loss of salt from the shaker.

Sweets. Patients may develop a craving for sweets during a prolonged study. This may be anticipated by the inclusion of certain sweets in the diet. Honey, jelly, or pure sugar candy may be used. Plain commercial vanilla wafers also are satisfactory. They are purchased by the case, weighed into servings, and frozen at the beginning of the study. Desserts, such as cake and pie and other mixtures, are not used

because of inevitable variations in composition. Likewise, cookies with fillings or chocolate coatings are not suitable.

Special Recipes. Formulation of special recipes (for example, low calcium bread [5]) may be necessary in some studies. Care must be exercised to avoid variation in content of water and solids by meticulous measurement of ingredients and standardization of cooking time and temperature.

SUPPLEMENTARY ELECTROLYTES AND MINERALS

To insure accurate intake of electrolytes and minerals, it is preferable to keep the amounts in the diet as low as possible and to supplement the diet with the desired additional amounts. The amount of the appropriate compound which is necessary for each period is weighed out and dissolved in a suitable volume of distilled water in the chemistry laboratory. This entire quantity is administered to the patient in equal doses at each meal of the period. The doses are measured by means of a pipette.

FLUIDS

A record of daily intake of fluid is kept. The intake is usually kept constant. Fluids in the diet, such as coffee, tea, milk, fruit juice, and cream, are included in this measurement, but the water content of solid foods is not taken into consideration unless water balance is being studied. Distilled water is used for drinking and cooking. A specified amount for drinking is measured daily for each patient and is taken within a certain time limit each day. Distilled water also is used for brushing the teeth. To avoid ingestion of unmeasured calcium, the use of tooth powder or paste is not permitted.

LABORATORY ANALYSIS OF DIETS

At the beginning of a study, each menu is weighed, cooked in the exact way the patient will receive it, and sent to the laboratory in a sealed, large-mouth glass jar for analysis. Supplementary salt or other electrolytes and minerals are not included. Experience has shown that analysis of a total sample diet is the best method with respect to labor, time, and accuracy. Analysis, however, may be carried out on each food separately or on an aliquot of the food for the day.

The diet is re-analyzed each time a new lot of any food is used which might introduce a significant difference in the composition. For example, it may not be possible to obtain meats from one animal in large enough quantities for a prolonged study, and the diet is, therefore, analyzed each time meat from a new source is used.

RETURNED FOOD

It is the responsibility of the dietitian to inspect the tray when the patient has finished his meal to be certain that all food has been eaten. In our experience, returned food has not been a major problem. Whenever possible, such food is served with the next meal. If the patient has been well chosen and carefully instructed in the importance of eating everything served and nothing else, he is usually cooperative. If he is unable to eat part of a meal, the rejected food may be sent to the laboratory for analysis. If a patient leaves food frequently, the study is discontinued.

COMMENT

The success of a balance study depends on close cooperation among all members of the research team engaged in the investigation: the physician, nurse, dietitian, kitchen helper, biochemist, and laboratory technician, as well as the patient. To avoid errors, each must be constantly vigilant. Of great importance is the ability of the physician, nurse, and dietitian to establish good rapport with the patient, for on this may depend the latter's ability and willingness to cooperate.

No controlled clinical investigation of this type is stronger than the dietary department responsible for the intake of food (4). The most carefully planned study is of no value if the patient does not eat the diet; hence, the art of dietetics must not be lost to the scientific side. A pleasant and cheerful ward is an aid in keeping a patient happy. A patient who does not eat is often an unhappy one. Attractive trays and dishes are helpful. Tray decorations and party favors help create an atmosphere of festivity at holiday time when extra foods cannot be taken. Inexpensive surprises for children's trays often aid in persuading them to consume the entire meal.

The honesty, sincerity, and accuracy of the kitchen staff are important. Unless the diet is accurately prepared, the study is worthless. The dietitian should give close supervision to the kitchen staff and be constantly on the lookout for inadvertent errors. If an error is recognized promptly, it is frequently possible to rectify it. The research dietitian must be willing and able to give close attention to details. Her work is exacting and requires absolute honesty, accuracy, and patience.

The dietary techniques employed are aimed not merely at keeping the diet approximately uniform from day to day, but also at keeping variations of intake in successive periods of a prolonged study at a minimum, so that any change in balance may be attributed to treatment or to changes in metabolism rather than to fluctuation of intake. The correlation between data on intake and output can be very satisfactory if a study is carefully planned and executed.

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BIOGRAPHICAL NOTES FROM THE HISTORY OF NUTRITION

Alexis Soyer—October 14, 1809–August 5, 1858

To Florence Nightingale goes the distinction of being the first modern hospital dietitian, and Alexis Soyer, her friend and co-worker in the Crimea, merits the title of first army dietitian. He gave up the comforts and luxury of being one of the leading chefs of all England, famed for his banquets, to go to the Crimea and bring order and good food preparation to the army. He invented a new type portable cooking stove for use in camp or hospital—a stove that was safe and used one-fourth the amount of fuel used for other types then available. It was so satisfactory that it was still in use by the British army in 1935. He taught the soldiers how to cook and to make their rations appetizing and nourishing. At the request of Miss Nightingale, after he had returned to London, he organized schools of regimental and hospital cookery, planned kitchens and general diets, and prepared suitable recipes. He wrote a booklet, *Instruction to Military Hospital Cooks in the Preparation of Diets for Sick Soldiers*, which was adopted by all military hospitals. He lectured on military dietetics at the United Services Institute in London and designed a cooking wagon for an army on the march; all this was almost a hundred years ago.

Alexis Soyer is one of the fascinating personalities in the history of dietetics, because of his accomplishments and the many contradictions in his character. The theater, love of approval and applause, colorful eccentric clothes of his own design, and gay company were his delights. Chance led him into the field of cookery. He was born on October 14, 1809, in a small town near Paris, the third son of a shopkeeper. His mother wanted him to be a priest, and when nine years old he was sent to the Cathedral school as a chorister. But he had no love for discipline and since his mother would not take him away, he got himself expelled by ringing the church bell at midnight; this was the local fire alarm. He went to stay with his elder brother, Philippe, who was a cook in Paris, and received excellent training there. When twenty-one, he again joined his brother who was then employed by the Duke of Cambridge in London. England was Soyer's home for the rest of his life, and there he made his name as a chef. The kitchens he planned at the Reform Club and the banquets he served there were famous.

Soyer had that rare skill of being able to prepare the most magnificant banquets and the simplest, cheapest meals for the poor. In 1847 when there was famine in Ireland and three million people were supported by relief, Soyer went to Dublin and superintended the building of a model kitchen which served over 8,000 meals a day at a lower cost for better food than had hitherto been possible. He knew the value of the outside of vegetables and begged everyone to use them. While in Ireland he published *Charitable Cookery or The Poor Man's Regenerator*, a fifty-page booklet, the profits from which went to charity. He also served a Christmas dinner to 22,000 of the poorest of the poor in London, roasting a whole ox for the occasion and engaging a band to play during dinner.

In the summer of 1857 Soyer was thrown from his horse, and though he soon again continued his busy round, he became seriously ill in the spring and died August 5, 1858.

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Starvation and Nutritional Rehabilitation

A Quantitative Case Study[1]

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THE conditions and results of the starvation-rehabilitation experiment carried out at the Laboratory of Physiological Hygiene, University of Minnesota, have been presented in detail (1), together with a critical digest of the extensive literature on the subject. Systematic consideration of individuals in the form of a case study was limited to the psychologic area, and even there the emphasis was on the cases of especially severe "semistarvation neurosis." It may be interesting and instructive to follow a single individual, typical of the group, through the maze of measurements of the morphologic, biochemical, physiologic, and psychologic characteristics during the different phases of the experiment. This is the purpose of the present paper. It will be supplemented by a study based on qualitative, clinical observations and semiquantitative ratings (2). The two studies taken together provide a compact portrait of the effects of prolonged caloric deficiency and of subsequent recovery.

The methods used were described elsewhere (1, pp. 1071–1118). The chronology of the experiment was briefly:

Control period	12 weeks (C)
Semistarvation	24 weeks (S1 to S24)
Restricted rehabilitation	12 weeks (R1 to R12)
Unrestricted food intake	8 weeks (R13 to R20)
Follow-up testing	at R33

In the text the abbreviations S and R with a numeral following will be used to indicate the week of the semistarvation or rehabilitation period to which a measurement or observation refers.

The general characteristics of the subject, who was designated as No. 123 and whom we shall call Don, are indicated in Table 1. He was a tall, rather lanky fellow, with weight below the height-age-sex standard. He scored almost two and a half standard deviations above the national average on the Army General Classification Test. Clinically, he was free of disease and there was no important pathology in his medical history. His scores on the Minnesota Multiphasic Personality Inventory were within normal limits.

TABLE 1

*Some general characteristics of Subject No. 123 during the control period**

Age	25	yr.
Height	181	cm.
Weight	64.7	kg.
Standard weight	74	kg.
Intelligence, standard score†	154	

* For group means during the control period and the standard deviations of the control data, see Tables 2, 3, and 13.

† Army General Classification Test. General population = 100, standard deviation = 20.

FOOD INTAKE AND BODY WEIGHT

Don's caloric intake and average weekly weights are given in Figures 1 and 2. During the control period a calorically adequate diet was provided, satisfactory as to specific nutrients, variety of food items, and palatability. The average of four representative menus of the basal control diet contained about 100 gm. protein, 130 gm. fat, and 400 gm. carbohydrate. Protein, fat, and carbohydrate contributed 13, 37, and 50 per cent, respectively, to the caloric value of the diet. The vitamin content of the basal control diet was as follows: vitamin A, 8600 I.U.; thiamine, 1.86 mg.; riboflavin, 2.52 mg.; niacin, 15.4 mg.; and ascorbic acid, 108 mg. The basal control diet was adjusted quantitatively on an individual basis, with the aim of bringing all subjects closer to their "standard" weight. The average

[1] Support for this work was derived from a variety of sources, which are listed in *The Biology of Human Starvation* (1). Presented at the meeting of the Ohio Dietetic Association in Akron, on April 26, 1952.

[2] Acknowledgment: The quantitative data on which this study is based have been obtained in cooperative research involving Dr. Ancel Keys (Director), Drs. Austin Henschel, Olaf Mickelsen, Ernst Simonson, Henry L. Taylor, and Mrs. Angie Sturgeon Skinner. Dr. Harold Guetzkow and Joseph C. Franklin provided valuable assistance in the psychologic area.

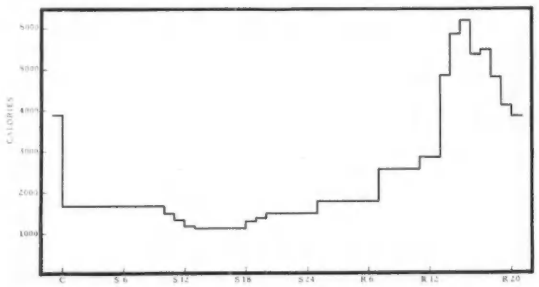

FIG. 1. *Daily caloric intake of Subject No. 123.*

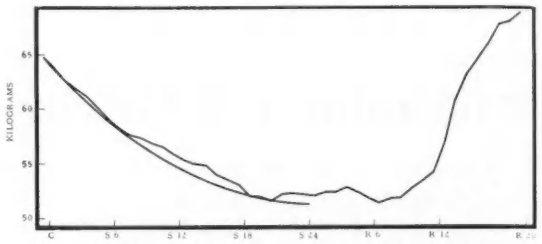

FIG. 2. *The "predicted" curve of weight loss during starvation (parabola ending at S24) and the actual body weight of Subject No. 123.*

caloric intake of our subject during the control period was about 3900 calories. His average actual intake during the twenty-four weeks of starvation was 1470 calories.

The starvation diet consisted of three menus which were rotated. The basal diet, modified in individual cases by altering the amount of bread and potatoes, contained 53.2 gm. protein, 34.5 gm. fat, and 295.0 gm. carbohydrate. Protein, fat, and carbohydrate contributed 12.5, 18.2, and 69.3 per cent of the calories, respectively. In contrast to the control diet, there was a marked reduction in calories derived from fat and an increase in calories from carbohydrate. In terms of individual foodstuffs, cereals (bread, farina, oatmeal, spaghetti, macaroni, pancakes) contributed 54.7 per cent of the total calories; dairy products (milk, butter, cheese), 10.0 per cent; vegetables and fruits (potatoes, cabbage, turnips, rutabagas, tomatoes, peas, apples), 22.1 per cent; meat and fish, 2.8 per cent; and sweets (sugar, jam, sirup), 10.4 per cent. From the composition of the diet, it is apparent that it was designed to approximate the type of foods likely to be available in European famine areas. The vitamin content of the basal semistarvation diet was: vitamin A, 1600 I.U.; thiamine, 1.29 mg.; riboflavin, 0.60 mg.; niacin, 20.7 mg.; and ascorbic acid, 83 mg.

During the period of controlled rehabilitation (R1 to R12), the diet differed little from that used during the semistarvation period, except that the quantities of food were increased. The increases were made at R1, R7, and R10. Our subject was placed in the lowest of the four caloric groups and received neither the protein nor the vitamin supplements. During R13 to R20, no restrictions were placed on the diet the subjects chose to eat. The records indicated very high caloric intakes, in Don's case reaching about 6200 calories per day during the third week of unrestricted diet. The daily food intake returned to 3850 calories by R20 but must have continued high as indicated by the elevated value of the body weight at R33 (Table 3). Detailed records were not available for this period (R21 to R33) during which time the subjects no longer resided at the laboratory.

Figure 2 also contains the "desired" curve of weight loss during the starvation period. For Don the weight loss at S24 was set at about 21 per cent of the control value in view of the fact that he was underweight at the start of the experiment. For individuals whose weight corresponded to the standard weight for age and height (and bony framework), the weight loss was set at 25 per cent of the initial body weight. The predicted weight loss curve is a parabola with a zero slope at S24.

The actual and "predicted" (desired) loss of body weight coincided closely up to S6. At that time the actual loss of weight began to lag due to the development of edema. Further reduction of caloric intake, through a decrease in the potatoes and the bread ration, resulted in a temporary return to a predicted curve at S21. The presence of edema is indicated by the loss of weight (i.e., of water) in spite of increased caloric intake, from R3 to R7. The gross body weight began to rise beginning with the ninth week of controlled nutritional rehabilitation and showed a striking increase during the period of unrestricted caloric intake (R12 to R20). At R33 the body weight was 9.4 kg. (20.7 lb.) higher than at the start of the experiment.

EXTERNAL BODY DIMENSIONS

The data obtained by direct measurements on the body are presented in Table 2. Of the diameters, only the bideltoid diameter was substantially reduced during semistarvation, reflecting the loss of soft tissues. All circumferences indicate a decrease. A marked loss of subcutaneous fat was noted but, unfortunately, no skinfold measurements were made so that a differentiation between the loss of fat and of muscle tissue on the basis of anthropometric measurements is not possible. At R20 the circumference of the abdomen registered the largest gain, reflecting a heavy increase in the fat deposited in this area.

BODY COMPOSITION

For purposes of physiologic interpretation and adequate nutritional evaluation we cannot be satisfied with the data concerning the gross body weight. Different body compartments may undergo changes at different rates and even in different directions.

TABLE 2

*Body dimensions**

MEASUREMENT	MEAN FOR GROUP OF 32 AT END OF CONTROL PERIOD	SUBJECT NO. 123					
		C	S12	S24	R12	R16	R20
Diameter Measurements							
	cm.	*cm.*	*cm.*	*cm.*	*cm.*	*cm.*	*cm.*
Standing height	178.81±5.77	181.0	181.1	180.4	180.0		
Sitting height	93.09±3.00	96.2	95.3	94.2			
Bicristal diameter	27.97±1.36	27.6	27.6	27.6			
Bitrochanteric diameter	31.82±1.75	31.3	31.2	31.1			
Bideltoid diameter	43.61±1.39	43.2	40.0	39.0	40.0	43.4	44.8
Chest, transverse diameter	28.89±1.28	25.7	25.9	25.7			
Chest, anterio-posterior diameter	18.59±1.02	16.9	16.9	16.6			
Circumference Measurements							
Chest	89.28±3.33	87.1	80.6	79.1			
Abdomen	78.08±4.43	75.4	70.5	70.8†	73.5	81.0	82.3
Upper arm	28.49±1.78	28.6	24.0	21.5	22.8	27.3	28.6
Thigh	47.11±2.85	45.7	40.6	38.8	39.2	45.4	47.4
Calf	37.72±1.71	37.5	35.1	34.0	34.5	37.8	38.2

* Different stages of the experiment are indicated as follows:

C = Control
S = Semistarvation
R = Rehabilitation

The numbers following the letters indicate the approximate week during which records were made.

† Bloated.

Newer physical and chemical methods make possible a study of these changes in the living organism. As a first approximation in the breakdown of the gross body weight into its principal components, we may differentiate between the body fat and the "fat-free" body weight (gross weight − weight of fat). The amount of body fat was estimated from specific gravity. The changes over forty-four experimental weeks are summarized in Figure 3. In order to compare the two characteristics, the total change during starvation was used as the unit of measurement (100 per cent).

It is obvious that body fat exhibits higher mobility than the fat-free body weight. It decreased more rapidly in the initial phase of the starvation period and increased dramatically during the period of unrestricted food intake (R12 to R20), reaching 212.5 per cent at the end of this period. The fat-free body weight showed a slow decrease during the first twelve weeks of the starvation period and at R20, when the gross body weight surpassed the control value by more than 4 kg., the recovery of the fat-free body weight reached only 84.6 per cent of the total loss suffered during starvation. The fluctuations in the fat-free body weight in the late part of the starvation period and during early rehabilitation reflected rapid changes in hydration.

The fat-free body weight may be broken down theoretically into bone mineral, extracellular fluid, and the "active" tissue mass. No satisfactory methods are available at present for estimating the

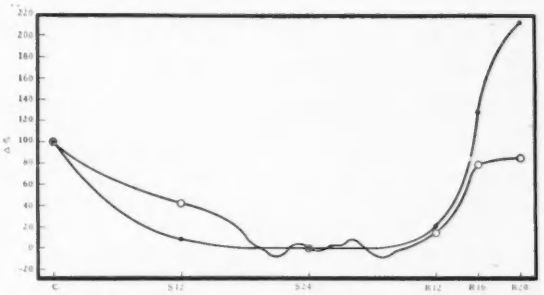

FIG. 3. *Comparison of changes in body fat (solid circles) and in the fat-free body weight (open circles), using the difference (△) between the starvation (S24) and control (C) values as 100 per cent.*

mass of the skeleton from the bony dimensions. As an approximation, this mass can be estimated at about 16 per cent of the standard weight. About one-fourth of this amount, or 4 per cent of the total, represents the mineral content of the skeleton. In our subject the standard weight (for age twenty-five) is 74.0 kg., and the estimated bone mineral weighs about 3.0 kg. Using radiologic methods, quantitative determinations of the density of selected bones were made by Dr. Pauline Beery Mack. No measurable change appears to have taken place during starvation, and the mineral compartment may be considered as essentially constant throughout the various phases of the experiment. Consequently, the value of 3.0 kg. was retained for all periods (Table 3).

TABLE 3

*Body composition**

BODY COMPONENTS	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123						
		C	S12	S24	R12	R16	R20	R33
Body weight (kg.)	69.39±5.6	64.7	55.8	52.1	54.2	64.5	68.9	74.1
Specific gravity	1.0704±0.0104	1.078	1.091	1.092	1.089	1.073	1.063	
Body fat								
As % of body weight†	13.91	10.3	4.1	3.7	5.1	12.6	17.5	
In kg.‡	9.65±4.18	6.7	2.3	1.9	2.8	8.1	12.1	
Fat-free body weight (kg.)	59.74	58.0	53.5	50.2	51.4	56.4	56.8	
Bone mineral (kg.)	2.78	3.0	3.0	3.0	3.0	3.0	3.0	
Extracellular fluid (liters)	16.4±1.1	(15.3) ⁂		(16.7) ⁂	(16.4) ⁂		(15.7) ⁂	
"Active" tissues (kg.)¶	40.6	39.7		30.5	32.0		38.1	

* See Table 2 for explanation of code.

† Corresponds to the average specific gravity.

‡ Based on body weights indicated in the table. Values differ somewhat from those obtained at the time of the specific gravity determinations.

⁂ Estimated values.

¶ Using the value of 1.01 as the specific gravity of the extracellular fluid, slightly lower values would have been obtained.

TABLE 4

*Composition of body fluids**

FACTORS	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123							
		C	S12	S24	R6	R12	R16	R20	R33
Intravascular and Extravascular Hydration—Plasma Proteins and Lipids									
Extracellular fluid (liters)	16.4±1.1	(15.3)†		(16.7)†		(16.4)†		(15.7)†	
Plasma volume (liters)	3.13±0.31	3.06		3.40					
Extravascular fluid (liters)	13.3	(12.2)†		(13.3)†					
Total plasma proteins (gm./100 cc.)	6.67±0.31	6.6		5.8		6.3	7.1	6.1	6.5
Circulating proteins (gm.)	209	202		197					
Cholesterol (mg./100 cc.)	169.3±24.0	200		159					
Blood									
Total blood volume (liters)	5.85±0.53	5.38		4.82					
Cell volume (liters)	2.72	2.32		1.44					
Hematocrit (% cells)	46.47±2.03	43.1		29.7					
Hemoglobin									
Gm./100 cc.	15.12±0.88	13.7		9.9	10.4	11.1			
Circulating (gm.)	885	737		477					
Erythrocytes (million/cu.mm.)	5222‡	4530		2960		3400			
Color index	0.98‡	1.00		1.15		1.10			
Leucocytes (per cu. mm.)	6340‡	6925		3650		5425			
Blood sugar									
Mg./100 cc. blood in basal rest	(83)			73.4	65.3	73.4			
Mg./100 cc. blood during aerobic work	71.4±5.6	77	64	59	60	52			
Urine									
Volume (liters/24 hr.)	1263±249	975	1797	2417	4190	2143			858
Nitrogen excretion (gm./24 hr.)	13.17±1.24	12.1	6.9	7.5	8.2	10.5			

* See Table 2 for explanation of code.

† Estimated value.

‡ For seven subjects only.

AMOUNT AND COMPOSITION OF BODY FLUIDS

No direct determinations of the volume of the fluid present outside the tissue cells (the extracellular fluid) were made for our subject. In the group of seventeen other subjects, the extracellular fluid volume, measured as the thiocyanate space, increased to 109.1 per cent of the control value at S24, was reduced only slightly at R12 (107.3 per cent), and returned to close to the normal value (102.4 per cent) at R20. In the control period the extracellular fluid represented 23.64 per cent of the gross body weight. The values in Table 4 were calculated on the assumption that Don followed the group trend. It should be noted that on an absolute basis the increase in extracellular fluid during starvation was not large. On a relative basis (as per cent of body weight) the change was quite striking. At S24 the extracellular fluid represented 32.1 per cent of the gross body weight.

Subtracting the weight of body fat, bone mineral, and extracellular fluid from the gross body weight we obtain a physiologically very important datum, the weight of the "active" tissues—muscles, glands, and nerves. Because of the increase in the relative hydration of the body (thiocyanate space), the loss of active tissues was larger than would be indicated by the decrease in the gross or the fat-free body weight. Whereas the fat-free body weight decreased only by 7.8 kg., the change in the active tissues amounted to 9.2 kg. This represents 13.4 and 23.2 per cent of the respective control values. The change in the gross body weight amounted to 12.6 kg. (19.5 per cent).

The extracellular fluid volume may be broken down into the intravascular fluid (plasma volume, estimated with the dye dilution method) and the extravascular component representing interstitial hydration of the tissues. There was an increase in both components amounting to 0.3 and 1.1 liters or about 10 and 9 per cent of the respective control values (Table 4).

Of interest is the level of protein in the plasma. In Don, the value showed a slight decrease. Knowing the plasma volume, in liters, we may calculate the total circulating proteins (Table 4). The change in semistarvation was negligible and did not portray the changes in the body's protein stores. It may be noted that the decrement in the circulating hemoglobin (Table 4) is a much more sensitive indicator of the altered nutriture.

The total cholesterol decreased on the average by about 20 mg. (group mean of 150.7 mg. per 100 cc. at S24), and the change was statistically highly significant. Don's decrement was larger than the average change. His average daily dietary fat intake was about 30 gm., as compared to some 130 gm. at C. To the dietary fat must be added an almost equal amount of fat derived from the body stores (4800 gm. metabolized in 168 days). This makes a total of about 60 gm. fat per day.

BLOOD

The total blood volume was obtained from the values for the plasma volume and for the relative mass of blood cells (hematocrit). The blood volume, in liters, showed a slight decline in starvation, the decrement being due to the decreased cell volume (Table 4). The hemoglobin concentration decreased by 3.8 gm. per 100 cc. of whole blood; it increased slowly during the rehabilitation period and returned close to the normal value at R20 (13.2 gm.).

The number of red and white blood cells decreased markedly in starvation and rose slowly during the recovery. The color index, representing the ratio of hemoglobin and erythrocytes—both expressed as percentage of normal values—rose in starvation indicating that the number of red cells decreased more than the hemoglobin concentration.

Blood samples for sugar analysis were obtained both during rest, before the subjects got out of bed, and toward the end of a 30-min. walk on a motor-driven treadmill (3.5 m.p.h., 10 per cent grade). The basal average value for the group at S24 was 63.5 mg. per 100 cc. as compared with 83 mg. obtained for a group of normal young men. Don's S24 value was higher than for the group as a whole while in recovery his values were almost identical with the group averages of 65.2 and 73.0 mg. at R6 and R12, respectively. The blood sugar during work was lower than in the basal state and showed no recovery during the first twelve weeks of rehabilitation. This was true of the group averages as well (58.0 at S24, 57.2 at R12).

URINE

The data on nitrogen excretion are presented in Table 4. There was a decrement during semistarvation and fairly slow recovery. The group as a whole showed a more consistent trend, with 8.12 gm. per 24 hr. at S12 and 7.42 gm. at S24. Complete nitrogen balance studies were not made for Don. At R6 and R12 the daily nitrogen intake was 9.76 and 14.05 gm., respectively, leaving a "balance" of 1.6 and 4.0 gm. This is only a rough index of nitrogen retention as fecal nitrogen determinations were not made. The fecal nitrogen could account for most of the "balance" at R6.

Marked changes were noted in the total volume of the urine excreted per day. Polyuria, with increased frequency of urination, is a universal symptom reported from all areas of starvation in which the fluid intake is not limited. The phenomenon was present also in the Minnesota Experiment and is well portrayed by Don's urinary output. For the whole group, the daily volume was about twice as large at the end of semistarvation (2.285 liters) as

in the control period. At R6 there was a further increase and at R12 the values were still far above the normal level. There was a rapid decrease in the subsequent eight weeks of unrestricted food intake, with the group mean falling to less than 1 liter.

SEXUAL FUNCTION

Amenorrhea in women and loss of the sex urge ("libido") in men have been repeatedly reported from areas affected by famine. In the semistarvation experiment a small decrement was observed in the excretion of the 17-ketosteroids (mean 8.3 mg. androsterone per 24 hr. at S24, compared to the R56 value of 12.5 ± 2.4, N = 9); no values on the urinary androgens were obtained for Don. However, detailed data are available on sperm morphology (Table 5).

Collection was attempted but no sample could be obtained at the end of semistarvation. At R6 the volume was very small, with a high sperm density (number of sperm per cubic centimeter of semen), above average viscosity, low motility at the time of the initial examination of the semen, and low longevity. The last characteristic showed no change within the subsequent weeks, while in the sixteen men for whom data are available, the time during which the sperm remained motile increased dramatically during the twenty weeks of recovery (5.4 hr. at S24, 15.1 hr. at R6, 16.6 hr. at R12, and 33.0 hr. at R20).

TABLE 5

*Semen analysis of Subject No. 123**

MEASUREMENT	RANGE OF "NORMAL" VALUES	R6	R12	R20
Semen volume (cc.)	2 to 6	0.9	1.8	4.3
Sperm concentration (million/cc.)	60 to 200	780	230	25
Life (hr.)	24†	14	<15	15
Morphology (% normal sperm)	75†	68.9	68.9	80.5

* See Table 2 for explanation of code.

ENERGY METABOLISM

Under conditions of energy equilibrium, such as was approximated at the end of the control and the semistarvation period, the energy intake may be accounted for in terms of the basal metabolism, the "specific dynamic action" of the food eaten, and the residuum which reflects largely the variations in the level of physical activity. As indicated in Table 6, there was a very striking reduction of the latter fraction during semistarvation. This agreed well with the pronounced reduction in voluntary muscular work noted by direct observation (Fig. 4).

The basal metabolism had also definitely decreased, even when expressed as calories per kilogram of "active tissue," but the change was much less marked. The relative changes in basal metabolism, with the difference between the C and S24 values considered as 100 per cent, are indicated in Figure 4. The determinations have been made fairly frequently and the trend can be portrayed with considerable accuracy. The dramatic rise during the first week of unrestricted food intake (R13) should be noted. In subsequent weeks the basal metabolism steadily declined but still at R33 it was

TABLE 6

*Energy metabolism**

CALCULATION	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123						
		C	S12	S24	R6	R12	R20	R33
Basal metabolism (liters of O_2/24 hr.)	328.5±19.4	302.4	214.6	184.3	213.1	253.4	365.8	330.0
Basal metabolism (calories/24 hr.)†	1593±94	1467	1041	894	1034	1229	1774	1600
Basal metabolism (calories/sq. m. body surface)	850±50	796	608	531	629	726	942	824
Basal metabolism (% of standard)	−11.8±4.4	−12	−37	−44	−35	−25	−3	−14
Basal metabolism (calories/kg. active tissues)	39.2	37.0		29.3		38.4	46.6	
Caloric intake (calories/24 hr.)	3539	3896	1330	1488	1777	2842	3800	
Specific dynamic action (calories)‡	265	292		112				
Physical activity (calories/24 hr.)#	1681	2137		482				

* See Table 2 for explanation of code.

† Using 1 liter O_2 = 4.85 calories.

‡ Estimated at 7.5% of the caloric intake.

Caloric intake − (specific dynamic action + basal metabolism).

23 per cent above the control value. In reference to Mayo Clinic standards, at C Don was 12 per cent below the "normal," sharing the group trend. This is to be interpreted as the result of practice and of a more complete degree of relaxation.

CARDIOVASCULAR CHANGES

Cardiovascular Functions at Rest. In severe undernutrition one regularly finds a number of alterations in cardiovascular functions—slowing down of the pulse rate, lowering of the blood pressure, decrease in skin temperature, slight grayish-blue tinge of the skin, especially noticeable on the lips and the nail beds, dizziness, and blackouts. All of these were reproduced under the experimental conditions.

Bradycardia was noticed early in the semistarvation period. The average pulse rate, measured during basal metabolism determinations dropped to 40.8 beats per minute at the end of the fifth week. Don's value at this time was 42. His lowest value, 32 beats per minute, was obtained during S20. The rise in recovery was slow at R12. Subsequent unrestricted food intake was associated with a sharp increase in pulse rate, not recorded in Table 7, with values of 80 at R14 and 71 at R16.

The changes in blood pressure were slower to appear. Thus Don's systolic blood pressure at S5 decreased only by 2 mm. and the average decrement in the whole group was equally slight. At S12 the decline was very definite and there was small further gradual decrease to S24. Following R12, there was a rise in the blood pressure, with a value of 104 mm. at R14 followed by a temporary decline to a subnormal level of 90 mm. at R16 and subsequent return to the pre-starvation level. The diastolic blood pressure was little affected by semistarvation—with an average decrement of about 5 mm. mercury at S24—and in Don showed no consistent trend. The venous pressure was somewhat decreased during starvation; it returned to a normal level (10.6 cm. water) by R16.

The stroke output of the heart, estimated from roentgenokymographic measurements of the heart size during systole and diastole, declined during starvation (a mean of 54.8 cc. at S24). Don's recovery in this function was more rapid than in the average subject; it was completed by R12.

The effects of changed position of the body were studied quantitatively by means of a tilting table

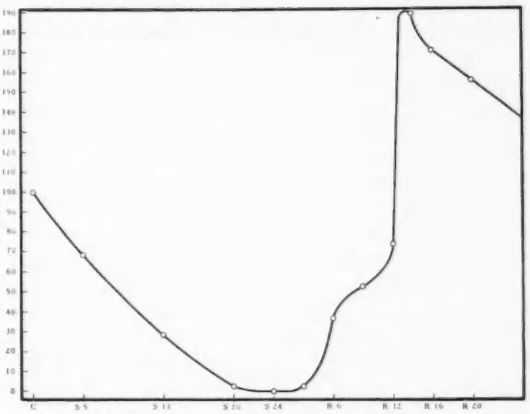

FIG. 4. *Basal oxygen consumption in calories per square meter of body surface per 24 hr. Difference (△) between values at C and S24 is used as the unit of measurement (100 per cent).*

TABLE 7

*Cardiovascular data**

TEST OR MEASUREMENT	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123						
		C	S12	S24	R6	R12	R20	R33
Cardiovascular Functions at Rest								
Basal pulse rate (beats/min.)	55.2 ± 6.5	53	43	37	40	48	66	66
Basal systolic blood pressure (mm. mercury)	106.5 ± 6.7	96	86	82	92	90	94	98
Venous pressure (mm. water)	(10.0)†			8.4	7.2	8.4	10.6	
Stroke volume (cc.)	66.9 ± 5.4	59.9		47.4		59.3		
Pulse Rate During and Following Aerobic Work‡								
Work pulse								
Beats per minute	133.9 ±12.9	129	128	136	125	139	147	
Increment above basal pulse	78.7 ±11.4	76	85	99	85	91	81	
Recovery pulse								
Beats per minute	105.9 ±11.8	108	100	96	98	115	125	
Increment above basal pulse	50.7	55	57	59	58	67	59	

* See Table 2 for explanation of code.

† Based on measurements obtained for twelve normal young men who resided in the Laboratory but who did not take part in the starvation experiment.

‡ Walk on a motor-driven treadmill.

TABLE 8

*Respiration in aerobic work (walk on a motor-driven treadmill)**

MEASUREMENT	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123			
		C	S24	R6	R20
Respiratory volume (liters/min.)	32.56 ± 4.28	28.4	32.0	28.2	31.1
Respiratory efficiency	55.54 ± 4.14	57.6	41.7	46.2	58.8
Oxygen consumption (cc./min.)	1798 ±174	1635	1332	1301	1827
Respiratory quotient	0.878 ± 0.026	0.92	0.95	0.95	0.92
Net calories/kg./min.	0.1103	0.109	0.116	0.114	

* See Table 2 for explanation of code.

which allowed a rapid shift from a horizontal position to 68°. The passive tilting did not reproduce the symptoms of dizziness and "blacking out" noted frequently by the subjects on standing up. The change in the pulse and the blood pressure, due to the change of posture, was not importantly affected by semistarvation.

Cardiovascular Functions During and Following Physical Work. The responses to physical work were studied both in work which could be performed for a prolonged period of time (aerobic work) and in severe physical exercise leading to exhaustion in a matter of minutes or even seconds (anaerobic work). The aerobic work test involved a 30-min. walk on a motor-driven treadmill (3.5 m.p.h., 10 per cent grade). The pulse rates, determined at 25, 28, and 30 min. of the walk and averaged, showed a small rise during semistarvation. This must be interpreted as a sign of deterioration of the work capacity, because the work load due to the decreased body weight was lessened. In view of the increment in body weight during the later phases of refeeding, the interpretation of the high pulse rates at R12 and R20 in terms of work capacity must be cautious. A better indication of physical deterioration during starvation is the pulse rate increment (the difference between work pulse rate and the basal pulse rate). At R20 this value returned close to the normal while the absolute rate of pulse during work remained high.

At the end of the 30-min. walk, the subject stepped off the treadmill and remained standing. The pulse rates, obtained at the start of the second and the third minute and averaged (recovery pulse), progressively decreased in semistarvation—a phenomenon ordinarily interpreted as an indication of a "good" physical condition. This value becomes somewhat more meaningful when expressed as increment above the basal value of the pulse rate but in Don the change during starvation was minimal.

The "anaerobic" work consisted of running on the treadmill to exhaustion or for a maximum of 5 min. (7 m.p.h.; 8.6 per cent grade). The duration of the run, as an index of endurance, will be considered together with the other aspects of motor fitness. From the duration of the run plus the recovery pulse rates are calculated a "fitness" score (control mean = 64.1, standard deviation = 17.2). Don's scores for the five periods indicated in Table 7 were 78, 31, 8, 17, and 40. At R20 the recovery amounted to only 57 per cent of the starvation deterioration.

RESPIRATION AT WORK

The respiratory volume per minute was measured during the last 5 min. of a 30-min. walk on the treadmill (3.5 m.p.h., 10 per cent grade). Don's values showed no systematic changes while the group means indicated a small decrement (value of 29.0 liters at S24). His respiratory efficiency (cubic centimeters of oxygen removed per liter of expired air) during work decreased, as it did in the whole group (mean of 46.5 at S24) and returned to the control value before R20 (Table 8).

The amount of oxygen used in 1 min. diminished in line with the loss of body weight. For the group as a whole there was no significant difference in the caloric expenditure at C and S24 when the oxygen consumption was corrected for the basal oxygen intake and expressed as cubic centimeters per kilogram of body weight. The fact that the efficiency of walking uphill, representing moderately hard physical work, has remained substantially unaltered is of interest. It is an indirect measure of the ability of the organism to carry out coordinated but highly automatized movements without impairment. In rehabilitation the oxygen consumption during work increased in proportion to the rise in body weight and, consequently, the caloric cost of work per kilogram of body weight again remained unaltered. The respiratory quotient (ratio between CO_2 expired and O_2 inspired) showed a small but definite rise during semistarvation (group mean = 0.931 at S24), reflecting the fact that the semistarvation diet was low in fat and high in carbohydrate.

SPECIAL SENSES

The special senses were remarkably resistant to the prolonged and severe caloric deficiency. Visual acuity showed small, random fluctuations (Table 9). Changes in the flicker fusion frequency, a measure of the resolving power of the retino-cortical sys-

tem, were fairly consistent and, consequently, statistically significant, but the decrement was very small and biologically unimportant. The rate at which an ambiguous figure changed its perspective showed larger but random fluctuations.

The acuity of hearing was measured under highly standardized conditions, free from interfering sounds. The measurements are expressed as "hearing loss," in decibels, on a scale from 0 ("normal" hearing) to 120 (total deafness); low scores indicate a good auditory acuity. During starvation there was actually an improvement of the auditory acuity, with progressively lowered threshold intensities. Only the values for the intermediary frequency of the testing tone (2048 cycles per second) are presented. Don's initial threshold was fairly high but showed a definite decrease during starvation. The trend was reversed during refeeding.

TABLE 9

*Sensory functions**

MEASUREMENT	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123				
		C	S12	S24	R6	R12
Visual threshold (mm. at 100 foot candles at 15 ft.)	0.69±0.14	0.69	0.73	0.73		
Visual threshold (mm. at 1 foot candle at 15 ft.)	2.11±0.45	2.0	2.1	1.9		
Flicker fusion frequency (rate of flashes/second)	36.3 ±3.2	35.0	35.0	34.5		
Hearing loss (decibels at 2048 cycles/second)	0.58±5.89	18.3		12.7	16.3	22.7

* See Table 2 for explanation of code.

MOTOR FITNESS

Four aspects of voluntary motor performance are generally recognized: strength, speed, coordination, and endurance. These different facets of motor fitness were affected very unequally by the loss of body weight and the accompanying changes in the machinery of the body. Strength showed a definite and biologically important decrease (group means of 41.8 and 116.1 kg. for hand grip and back lift respectively at S24). Speed—whether measured as the time of a complex reaction to visual stimuli or as the rapidity of successive movements of the hand (tapping) or of the whole forearm—did not change appreciably. In the group as a whole, coordination showed a tendency toward deterioration. Don's values were not clear cut and indicated a good deal of random fluctuation characteristic of the test (Table 10).

Profound alterations were found in the subjects' endurance, measured as the ability to run on the motor-driven treadmill (mean of 50.2 seconds at S24 for all men). The recovery of endurance proceeded very slowly and at R20 it was still far from complete

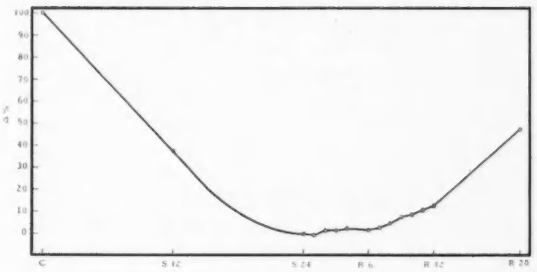

FIG. 5. *Endurance (duration of treadmill run in seconds). Difference (△) between values at C and S24 = 100 per cent.*

TABLE 10

*Motor fitness**

MEASUREMENT	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123						
		C	S12	S24	R6	R12	R20	R33
Strength								
Hand dynamometer (kg.)	58.2 ± 7.6	58	50	39	38	41	49	55
Back dynamometer (kg.)	165.4 ±27.8	151	122	109	109	113	136	
Speed								
Complex reaction time (1/100 second)	42.3 ± 3.7	42	44	44	44	42	41	
Coordinated movements (no./min.)	75.3 ± 5.7	78	75	72	74	77		
Tapping (no./10 seconds)	66.6 ± 5.5	72	71	70	70	73		
Coordination								
Number of errors	115.3 ±13.7	127	136	128	142	124		
Duration of errors (seconds)	9.19± 1.92	9.5	9.5	9.8	10.8	8.9		
Endurance								
Treadmill run (seconds)	241.6 ±62.9	300	106	17	21	52	152	
Kgm.† work/kg. body weight	64.9	66.5	28.4	4.6	5.6	13.9	40.8	

* See Table 2 for explanation of code.

† Kilogrammeters. This is a measure of "physical work" (lifting the weight of the body itself by walking on an inclined treadmill).

TABLE 11

*Intelligence and personality**

FACTOR	MEAN FOR GROUP AT END OF CONTROL PERIOD	SUBJECT NO. 123				
		C	S12	S24	R6	R12
Intelligence (total raw score)†	137.9±26.1	176	173	169		
Hypochondriasis‡	45.7± 3.4	47	54	60	56	48
Depression‡	54.2± 6.5	52	63	70	63	60
Hysteria‡	59.0± 6.1	63	70	78	75	71
Schizophrenic scale‡	47.5± 7.5	40	40	46	44	40

* See Table 2 for explanation of code.

† Test measured four factors: completions, arithmetics, vocabulary, and directions.

‡ Minnesota Multiphasic Personality Inventory. "Normal" average = 50, standard deviation = 10.

(Fig. 5). In comparison with the strength of grip, the decrement of endurance in starvation was more rapid (62.5 vs. 42.1 per cent of the total decrement at S12) while in rehabilitation the recovery was slower (47.7 vs. 52.6 per cent at R20).

INTELLIGENCE AND PERSONALITY

The intellective capacity was measured both by tests which were short and strictly limited in time ("speed" tests) and by long tests with no limit on the work time ("power" tests). None of the six speed tests, measuring individual "factors" of intelligence (such as inductive reasoning and perception of spatial relations), showed a statistically significant mean change in semistarvation. Don's test scores showed relatively small changes, with no consistent trend. The power test of intelligence consisted of four sub-tests (completions, arithmetic, vocabulary, and directions). On the average, the total (raw) score decreased very slightly during the semistarvation period (mean of 135.5 at S24). Don's performance was very high during the control period and his decrement in the total score was somewhat larger than for the group as a whole. At S24, there was no change in arithmetic and vocabulary. There was a 2-point decrement on the completions sub-test and a 5-point decrease in the directions (a test requiring a good deal of sustained attention) (Table 11).

The personality changes during the prolonged caloric deficiency were marked and can be conveniently labeled as a "semistarvation neurosis." On the Minnesota Multiphasic Personality Inventory, important deviations from normality were observed in the three "psychoneurotic" scales—hypochondriasis, depression, and hysteria—although some changes were observed also on the "psychotic" scales, especially schizophrenia. In Don's case, the scores on the schizophrenic scale and the scale for hypochondriasis returned to normal level by R12 while the depression and hysteria scores remained elevated.

COMMENT

The tables and graphs present, in a fairly comprehensive manner, Don's biologic history during the control, semistarvation, and rehabilitation periods. The data characterize a great number of facets of an individual human organism undergoing a prolonged period of caloric restriction, followed by refeeding, but no exhaustive coverage was attempted. Some variables which would be of interest (e.g., total body water) were not measured at all while other measurements (e.g., those of extracellular fluid) were made on some subjects but are not available for Don. For purposes of space economy we have omitted the electrophoretic analysis of blood serum; data on urinary vitamin excretion, gastrointestinal system, and morphology of the heart; respiratory characteristics at rest; electrocardiographic characteristics; histologic analysis of white blood cells and the sperm; and detailed data on personality tests and inventories.

The use of a "typical" subject provides a fairly satisfactory picture of alterations which took place during the semistarvation phase of the study. Even there, the critical reader would like to have an indication of the "error of measurement" inherent in repeating any particular measurement. Unfortunately, this information is missing for quite a few measurements made on Don. The available data are being presented in a separate communication (3). These values would not apply directly because some of Don's test scores represent averages of two or more independent determinations.

The study of an individual case is definitely inadequate for a portrayal of the period of nutritional rehabilitation. Although some useful information is provided by the response of this particular subject to the increases in food intake, the complex design of the rehabilitation phase of the experiment demands an intricate statistical analysis, based on data obtained for all thirty-two subjects.

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During the past three years, more than 10 million lb. nonfat dry milk solids have been used annually in the school lunch program.

A Study of Lay Publications on Child Feeding[1]

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PHYSICIANS, teachers, and dietitians have suggested that printed reading materials on child feeding now available suffer from a number of inadequacies and that many in current use do not give parents the kind of help which would enable them to deal effectively with the various problems that arise in the everyday feeding of the child.

The purpose of this study was to examine selected printed materials on feeding children with reference to the following questions:

(a) What topics are included?

(b) Are the topics discussed those which parents who are guiding children feel are useful?

(c) Are the facts scientifically accurate?

(d) When behavior is discussed, is consideration given to the fact that many different factors may produce it?

(e) What is the reading difficulty?

PROCEDURE

Seventy-six pamphlets relating to the feeding of infants and preschool children were obtained from state public health departments, state agricultural extension services, and the U. S. Children's Bureau.

A general examination of the bulletins was made for length, color of the paper, color of printing ink, and number of illustrations. A detailed examination was made for: (a) content, (b) scientific accuracy, (c) degree of "causality" recognized in discussions of behavior, and (d) reading difficulty.

Classification of Topics

To determine what topics were included in the pamphlets, a classification consisting of nine major categories was devised. It was developed by making a rapid survey of a sampling of the pamphlets and listing the topics that were found. A tentative list of items grouped under appropriate major categories was then prepared and the classification begun. If a topic not included in the first outline appeared, it was inserted in its proper place, and the pamphlets were rechecked. This procedure was followed until all the material had been classified.

The space given to each category was determined by counting the number of words and expressing this number as per cent of the total word count. Each of the nine major categories included subtopics. The nine major categories used are listed below:

1. Indices of nutritional status
2. Regularity of eating and length of time for feeding
3. Weaning
4. Breast feeding
5. Artificial feeding
6. Food needs
7. Guiding the child in learning to eat
8. Special problems
   a. Colic
   b. Underfeeding
   c. Overfeeding
   d. Hiccoughs
   e. Spitting up and/or vomiting
   f. Bowel movements
   g. Burping the baby
   h. Rickets
   i. Malnutrition
   j. Scurvy
   k. Eczema
   l. Pellagra
   m. Anemia
   n. Prematurity
9. General suggestions on health

The reliability of the classification was determined by the per cent agreement between two observers in checking the subtopics included in four pamphlets. This varied from 66.6 to 88.0 per cent.

Parents' Recommendations

To determine the topics mothers suggest should be included in a pamphlet on child feeding written

[1] Presented in partial fulfillment of the requirements for the degree of Master of Science, State University of Iowa, Iowa City.

for them, a list similar to that used in classifying the available materials was drawn up in a "checklist" form. An analysis of the problem of guiding the feeding of the child suggested some topics which did not appear in the classification outline. These were added to the parents' check list.

A short explanatory statement indicating what the topics included was prepared for each item. Space was provided for the mother to indicate whether she thought it would help to have something included in a pamphlet or book about the item, if she considered it not very important, or if she thought it could be of some help.

Twenty mothers were used as judges. Only those who had at least one child seven years of age or younger and who had had some academic work in high school or college dealing with children were used. Such work could include courses in home economics, nursing, nursery school education, medicine, or education as preparation for kindergarten teaching. By using mothers who had some training as well as the practical experience of feeding children, it was hoped to eliminate the possibility that a mother might check every item simply because she had not formulated her thinking sufficiently to be able to discriminate between the useful and the extraneous material.

Ratings of Scientific Accuracy

To score the scientific accuracy of the publications, the discussion of each topic was divided into thought units which were individually rated. A thought unit was defined as a sentence or a group of sentences which conveyed a complete thought or idea. Three degrees of accuracy—accurate, partly accurate, and inaccurate—were employed in the rating.

Research studies on the dietary requirements (protein, calcium, iron, vitamin D, ascorbic acid, and thiamine) of infants and children were abstracted and the findings used as one basis for judging accuracy. Secondary sources of information represented summaries of research by authors other than the original investigator or reports and observations of writers with extensive experience in the area of child feeding.

Previous investigations of the problems of scientific accuracy and preliminary analyses in this study suggested that inaccuracies in written material could be grouped into six types. These types are:

(a) Positive statements without qualification to allow for individual variations or differences.
Example: "Start weaning the healthy baby when he is six months old."
Many pediatricians today feel that the time of weaning should be determined by the baby's readiness for it. This would mean that age is not the only factor to be considered. The sentence quoted makes no provision for these other factors.

(b) Opinions for which no known evidence exists and for which no explanation is given as to why statement is made.
Example: "Almost always weaning should be started about the eighth or ninth month, and the baby should be completely weaned at ten months of age."
This statement is similar to the one in type "a" but is included here because there is some qualification: "almost always."

(c) Ambiguous statements which use such terms as "much more," "enough," and so on, without indication of their meaning.
Example: "Help your child to get enough rest and relaxation, so that he will not be tired at mealtime."
This thought unit does not explain how the mother is to know when the child has had "enough" rest and relaxation. To one mother it may mean a total of 10 hr. sleep in 24 hr., to another, 12 hr., or to another, 16 hr.

(d) Direct misstatements.
Example: "Your baby grows very rapidly from six months to a year."
According to the growth charts compiled from data of the Iowa Child Welfare Research Station, the average baby weighing 7½ lb. at birth weighs 17 lb. at six months and about 21¼ lb. at one year. This is a gain of 9½ lb. in the first six months and 4¼ lb. in the second six months. At birth he measures about 19¾ in.; at six months, 26¼ in.; and at one year, 29¼ in. This is a gain in length of 6½ in. in the first six months and 3 in. in the second six months. Therefore, the statement "Your baby grows very rapidly from six months to a year" is untrue if actual data are applied. The baby's growth is rapid during the first half year of life with a reduction during the second six months.

(e) Statements assuming that everyone has the same sense of values as shown by using imperatives such as "should," "do," and so on, without qualification.
Example: "Nurse your baby."
While breast feeding may be preferable to artificial feeding for many babies, there are

some circumstances under which it is contraindicated.

(f) Statements which may be correct but which have an erroneous implication.

Example: "As soon as your baby has a few teeth, give him toast or zwieback."

This sentence seems to imply that a baby should not be given toast or zwieback until he has teeth. However, many edentulous babies can chew toast or zwieback. In fact, in some pediatric services, when a baby is able to grasp objects, he may be offered a hard piece of toast as the first step in feeding himself regardless of the state of his dentition.

If a thought unit fell into one of the following categories, it was rated partly accurate:

(a) Statements which are only partly accurate.

Example: "When you are starting solid foods, place the spoon back in the mouth at first so he may suck and swallow with ease."

This statement was scored partly accurate because, although this method of starting solid foods is commonly accepted, it is only one method which could be used. Another method, which is more satisfactory for some babies, is placing the food at the tip of the spoon and offering it to the baby at the front of his mouth so that he can suck it off.

(b) Statements which give unknown facts or make predictions which may or may not be accurate without explanation.

Example: "When eight months old, the baby will be getting each day in addition to milk:

Cod liver oil: 2½ tsp.; or other vitamin D source—enough to give 800 I.U. vitamin D
Orange juice: 4 to 6 Tbsp.
Cereal: 3 to 5 Tbsp. Oats or whole wheat ones are best.
Egg yolk: 1
Green vegetable: 1 to 2 Tbsp.
Other vegetable: 1 to 2 Tbsp.
Stewed fruit: 1 to 3 Tbsp.
Hard dry toast: ½ slice for chewing.

This thought unit was judged only partly accurate because of the dogmatic prediction it makes—"when eight months old, the baby will be getting." It is difficult to predict so definitely what an individual baby will be eating at any specified time. The actual meaning intended may have been that these foods should be offered to the baby by the time he is eight months old. If so, a short explanation would have clarified the meaning.

In rating thought units, the investigator found that frequently a unit could be classified in more than one category. Such units were scored only once using the category to which it seemed most closely related.

The reliability of the accuracy scores was determined by per cent agreement between two observers who scored four pamphlets. This varied from 76.1 to 83.8 per cent.

Determination of the "Causal" Scores

Evidence presented in the literature on feeding disturbances in children indicates that children's feeding problems have many causes. Before suggestions can be given for the correction of these problems, it is necessary to determine the specific cause in each situation. It is important that written materials for parents recognize this concept.

In this study, discussions about behavior were scored according to the following scale:

1—the behavior is described but there is no recognition that many different factors may have produced it.

2—the discussion of the behavior implies that there are different causes and factors underlying it but they are not discussed or explained.

3—the discussion of the behavior states that something is producing it. Some of the possible explanations are discussed rather superficially.

4—some of the different causes and factors underlying the behavior are stated explicitly and discussed fully.

5—the behavior is described and the fact recognized that different factors might have produced it. They are discussed fully and the need for looking for the cause in each individual case is explicitly stated.

The reliability of the "causal" scale was determined by agreement between two observers who scored seven pamphlets. The two observers agreed within one scale step in 100 per cent of the cases.

Determination of Reading Difficulty

The level of reading difficulty was obtained by applying the Dale-Chall Reading Difficulty Formula (1) to forty-four pamphlets to which the formula seemed applicable. Some were written in the form of schedules and listings of foods, and the reading difficulty was not determined.

It is recognized that reading level is only one of

many factors which may influence the readability of a pamphlet. The interest of the reader, the format, his familiarity with the subject, and his desire for information are only a few of the possible important influences. However, it was felt that the application of the formula to the pamphlets would give some useful indication of reading difficulty.

FINDINGS

General Description of the Publications

A complete detailed analysis of the format of the publications was not made. However, certain characteristics of their general appearance were noted.

The pamphlets varied considerably in length with a range from 149 to 34,302 words. The median was 1772 words. The range of the middle half was from 950 to 3313 words. Total word count was chosen as the measure of the length of the pamphlets rather than page size or number because it was felt to be more representative. The pamphlets ranged from 1 to 112 pages, but because of different size type and number of illustrations, a pamphlet of ten pages often contained more information on child feeding than one of twenty.

Of the seventy-six publications, fifty-eight were devoted entirely to some aspect of child feeding while eighteen were on general child care and included sections on child feeding.

White paper was used for 64.4 per cent of the pamphlets; 35.3 per cent were printed on colored paper.

Black ink was used to print 77.6 per cent of the bulletins; 10.5 per cent used colored ink; and 11.8 per cent, a combination of black and colors.

The pamphlets were illustrated in 77.6 per cent of the cases. The number of illustrations ranged from 1 to 84 with a median of 6.

Lists of suggested readings were included in 21.0 per cent of the publications.

Classification of the Content

One measure of the relative importance attached to the various topics by the writers of these pamphlets is the frequency with which they are discussed. In Table 1 the topics have been arranged according to the per cent of the publications including a discussion of each item. The median per cent of total word count and the middle 50 per cent of the total word count are supplied for each item. To illustrate how the table is to be read, consider the first item, "Food needs." The figure in the second column indicates that 90.7 per cent of the 76 publications (a total of 70) at least mention food needs. Of these 70 publications, 50 per cent devote between 31.0 and 73.4 per cent of their total word count to a discussion of the topic. The median was 57.6 per cent. This indicates that 50 per cent of the bulletins devote more than one-half of their total words to a discussion of some aspect of food needs.

To indicate the extent to which the subtopics in each category were discussed, the number of times each item appeared in all the publications was totaled and converted to a per cent of the total number of publications examined. Because of the length of the list, it is not included here. However, it is interesting to examine the subtopics which received the highest and the lowest percentage scores. Such topics as "how to add new foods to the diet," "the use of bribes, rewards, or force in feeding the child," "daily or monthly food lists," and "food preparation" stood high in the list. On the other hand, such items as "lists of items which may be interpreted as signs of good nutrition" and "how the child's activities immediately before meals may affect his appetite" stood relatively low.

TABLE 1

Topics included in the publications

CATEGORY	PUBLICATIONS INCLUDING THE TOPIC	PROPORTION OF TOTAL WORD COUNT DEVOTED TO TOPIC	
		Range of middle half	Median
	%	%	%
Food needs	90.7	31.0–73.4	57.6
Guiding the child in learning to eat	84.2	7.7–45.1	16.7
Regularity of eating and length of each feeding	64.4	2.4– 8.8	4.4
Breast feeding	39.4	1.1– 5.6	2.3
Artificial feeding	39.4	1.8–19.3	7.8
Weaning	35.5	1.7– 7.2	3.5
General suggestions on health	34.2	3.3–17.2	7.1
Indices of nutritional status	23.6	3.4–16.7	14.0
Special problems			
Burping the baby	22.3	0.8– 1.7	1.1
Bowel movements	17.1	3.0– 4.0	3.3
Colic	7.8	3.3– 5.5	4.4
Spitting up or vomiting	6.5	1.3	1.3
Rickets	6.5	1.4– 3.7	3.2
Hiccoughs	5.2	0.3– 0.9	0.6
Prematurity	5.2	6.7– 7.0	6.8
Scurvy	5.2	0.7– 0.8	0.75
Anemia	3.9	0.5– 2.9	1.0
Malnutrition	3.9	2.8–12.5	4.7
Underfeeding	2.6	2.0– 2.2	2.1
Overfeeding	2.6	0.8– 1.2	1.0
Pellagra	1.3	0.5	0.5
Eczema	1.3	1.5	1.5

Results of Mothers' Recommendations

The mothers were asked to write *Yes* in the space following each subtopic if they thought it would help to have something included in a pamphlet or book about the item. They were asked to write *No* if they thought the item was not very important, and *Perhaps* if they felt it might be of some help.

To derive a total score for each item, *Yes* responses were given a value of 10; *Perhaps*, a value of 5; and *No*, a value of 0. The raw scores for each item were totaled and expressed as a per cent of the total possible score. For example, item "1.a" was marked *Yes* by sixteen judges, *Perhaps* by one, and *No* by three, giving a raw score of (16 x 10) + (1 x 5) or 165. Since there were twenty judges, the highest possible score was 200.

The subtopics receiving the highest possible score were: "the things in a child's appearance the parent could observe to get some idea of how well-nourished the child is," "how to prepare the formula for bottle feeding," "reasons why children vary in the amount of food they eat at different times," and "why and how to burp the baby." Other items which were high in the mothers' list were: "how the child's daily experiences (other than eating) may affect his eating behavior," "why breast feeding is suggested for many children," "what to do if the baby is fussy," "kinds of foods from which the child's daily diet may be chosen," "how to breast feed the baby," and "examples showing the many different causes of food refusal."

When a comparison was made between the items highest in the mothers' list and comparable items in the publications studied, it was noted that of the ten items high on the list, one was not represented at all in the publications. Of the remaining nine, four and possibly five could be thought of as having a fairly frequent coverage. The topics not covered adequately were: "things in a child's appearance the parent could observe to get some idea of how well-nourished the child is"; "how the child's daily experiences (other than eating) may effect his eating behavior"; "what to do if the baby is fussy"; how to breast feed the baby"; and "examples showing the many different causes of food refusal.

Space was also provided for the mothers to indicate what sources they consult for information on child care. When the twenty check lists were tallied, the results revealed that 100 per cent of the mothers consult pamphlets or books for information on child care. The sources which they use are given below with the per cent using each:

Written material given by the doctor	65%
Magazine articles	75%
State extension service pamphlets	25%
State public health department pamphlets	55%
Children's Bureau bulletins	70%
Books on child care (either self-selected or those given by someone other than the doctor)	85%

Ratings of Scientific Accuracy

The publications were scored by thought units using three degrees of accuracy: accurate, partly accurate, inaccurate. The per cent of total thought units placed in each of the three levels of accuracy was calculated. For example, Pamphlet No. *1* consisted of 167 thought units, of which 76.6 per cent were judged accurate, 10.1 per cent partly accurate, and 13.1 per cent inaccurate. The number of thought units ranged from 3 to 617, with the median being 64. The middle range (that is, the middle 50 per cent) was from 31 to 111 thought units. As to accuracy, the over-all range was from 36.3 to 100 per cent, with the middle range being 56.7 to 81.1 per cent. Only one publication was rated as 100 per cent accurate. Thus, there remained a significant proportion of partially or completely inaccurate thought units as determined by this method.

The reader may be interested in the types of inaccuracies. In Table 2 this information is presented, together with the per cent of the inaccurate units falling in each category. These data are based on the entire seventy-six pamphlets. It can be seen from this table that relatively few (3.7 per cent) of the

TABLE 2

Percentage of completely inaccurate thought units classified as to criticism

CATEGORY	PER CENT
Positive statements without qualification to allow for individual variations or individual differences	74.2
Statements which may be correct but which have an erroneous implication	8.4
Opinion for which no known evidence exists with no explanation of why statement is made	6.5
Statements assuming everyone has the same sense of values as shown by using imperatives such as "should," "do," etc., without qualification	4.3
Direct misstatements	3.7
Ambiguous statements which use terms such as "much more," "enough," etc., without indication of their meaning	2.6

TABLE 3

Percentage of partially inaccurate thought units classified as to criticism

CATEGORY	PER CENT
Statements which are only partly accurate	92.0
Statements which give unknown facts or make predictions which may or may not be accurate without explanation	7.9

inaccuracies were scored as direct misstatement of fact. About three-fourths were attributed to positive statements which do not allow for individual variation.

In Table 3 are given the types of partial inaccuracies found, together with the per cent falling in each category. This table shows that 92.0 per cent of the thought units were judged to be partially accurate because the statements gave some correct information but not enough to make the unit completely accurate.

"Causal" Scores

Of the twelve pamphlets analyzed for the degree to which they recognized the factors underlying the behavior discussed, only two rated above "3" on the scoring scale. All the bulletins scored above "1." In Table 4 are given the "causal" scores for each of the twelve pamphlets. It appears that even though there is slight recognition that different factors may produce behavior, the behavior is still treated mainly in terms of what is done rather than what may have caused it.

It would seem that until the concept that any given form of behavior may be produced by many different factors is well recognized and explicitly discussed in pamphlets of this kind, parents can only take the suggestions on what to do and apply them haphazardly. They may or may not find a suggestion which will produce the change in behavior which is desired.

TABLE 4

Recognition of multiple causes of behavior

PAMPHLET NUMBER	CAUSAL SCORE
11	2.0
29	3.0
30	3.0
34	4.0
40	2.0
55	2.0
57	2.0
58	2.0
59	2.0
62	3.0
70	2.0
76	4.0

TABLE 5

Reading difficulty of the pamphlets

GRADE LEVEL	PER CENT
7th– 8th	38.6
5th– 6th	31.8
9th–10th	15.9
4th and below	9.0
11th–12th	2.2
13th–15th (college)	2.2

Reading Difficulty

Forty-four of the seventy-six publications were measured for reading level. A summary of the reading difficulty expressed in terms of the school grade level and per cent of the pamphlets written at each level is given in Table 5. The table shows that 79.4 per cent of the forty-four pamphlets scored at the seventh to eighth grade level or below; 20.3 per cent scored at the ninth to tenth grade level or above. The 1940 census showed that the average adult in this country has had a little more than eight years of schooling. Therefore, his reading ability has been estimated at the seventh to eighth grade level. It seems that according to this measure of reading difficulty, a majority of the readers in the general population would be able to read the publications which were studied.

CONCLUSIONS

On the basis of these findings, the following conclusions seem indicated:

(a) In general, the emphasis in this group of publications is on the foods children need for growth and development. Many also include some suggestions for the parent on guiding the child in learning to eat. However, there are a number of aspects of guiding the eating behavior of children that mothers feel are important which are not represented in many of the publications studied.

(b) The usefulness of many of the bulletins is limited by their inaccuracies—due largely to a failure to qualify or explain positive statements.

(c) When behavior is discussed, only slight recognition is given to the concept that many different factors may have produced it; it is treated mainly in terms of what is done rather than the cause.

(d) A majority of the publications are written at a reading level adjusted to the schooling of the average adult in this country. However, there would still be a sizable group of people who may have difficulty in comprehending some of them.

REFERENCE

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Calcium Retained by Young Women Before and After Adding Spinach to the Diet[1]

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FOR adults, the Food and Nutrition Board of the National Research Council (1) recommends a daily intake of 1 gm. calcium. This recommendation, like all the recommendations, is tentative and subject to change in the light of more evidence. Most research workers in the field of calcium metabolism would agree that for young adults with normal stores, the average requirement lies between ½ and 1 gm. Within this area there is some disagreement as to the requirement and the amount which should be recommended. To obtain more information on the amount retained when intakes fall within that range, an iron balance study in our laboratory was extended to include a calcium balance on an intake of about 800 mg.

The study was set up in such a way that it was possible to observe also the effect of a serving of spinach a day on the calcium retention. While the oxalic acid of spinach is known to interfere with the absorption of calcium, to our knowledge, no studies have been made with adults to show the extent of the interference caused by an amount which might normally be included in the diet. In the case of children, Bonner *et al.* (2) found none of the calcium of a 100-gm. serving of spinach a day was absorbed. However, in view of the work of Lovelace, Liu, and McCay (3) which showed that when rats cease growing rapidly, their ability to absorb calcium oxalate is increased, one might anticipate that young adults would absorb relatively more calcium than children when spinach is in the diet.

PROCEDURE

Subjects

The subjects were six college women twenty through thirty-one years of age ranging from 153.8 to 163.1 cm. in height and from 51.2 to 57.0 kg. in weight (Table 1). They were judged by a physical examination to be in good health. According to a dietary history, all but one had been consuming at least two cups of milk a day and consequently their stores were presumably normal. Although they were students, they engaged in considerable activity: most of them spent many hours in laboratory work and had wide distances to traverse to attend their classes.

General Plan

In lieu of a controlled preliminary period, the subjects were directed to drink at least two glasses of milk each day for the week preceding the study. The experimental period extended over twelve weeks and was divided into three four-week periods. During the first period, a basal diet was fed to all the subjects. In the second period, three subjects received a basal diet plus a 120-gm. serving of spinach for breakfast, and the other three subjects received the basal diet plus a serving of spinach at the evening meal. In the third period, the subjects were reversed as to the meal in which spinach was fed. The morning and evening meals were alike except that beef was served at dinner and spinach at one or the other. All the milk and cheese were served in the noon

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TABLE 1

Age, height, and weight of the subjects

SUBJECT	AGE*	HEIGHT	WEIGHT†
	yr.	*cm.*	*kg.*
D. D.	23	156.2	51.2
J. S.	20	153.8	53.9
B. M.	31	160.0	52.1
L. O.	22	160.3	53.5
J. M.	23	162.5	52.9
D. C.	22	163.1	57.0
Mean		159.3	53.4

* The age is given to the nearest birthday.

† Means of weights taken at the first of every week.

meal. The reversal of subjects and the placing of all the milk and cheese in the noon meal were necessary for the iron metabolism part of the study.

The Diet

The basal diet was planned to meet the daily allowances recommended by the Food and Nutrition Board of the National Research Council (1) with the exception of iron and calcium. Minimum requirements for those two elements were selected because these levels are more critical than higher ones for measuring differences in absorption. Accordingly, the diet was planned to contain 800 mg. calcium. It was made up of a wide variety of common foods and was supplemented with 0.5 mg. thiamine hydrochloride. About 70 gm. protein were included. The menus were planned for one week and repeated during each of the twelve weeks. To meet the varying caloric needs, bread was allowed *ad libitum* at the noon meal and butter and sugar at all meals. Distilled water was used for drinking, and the subjects were required to brush their teeth with a mixture of chemically pure salt and soda.

Each subject consumed 120 gm. spinach daily for eight weeks. It was a commercially frozen product which had been cooked quickly in a small volume of water and drained thoroughly. The blanching in preparation for freezing may have removed some oxalic acid; more was removed by draining after cooking.

Collection and Analysis of Samples

The methods of collecting and making weekly composites of food and feces were described in detail by McMillan and Johnston (4). Weekly composites of the urine were preserved by the addition of enough hydrochloric acid to make a 2 per cent concentration. All samples were dry-ashed and treated to remove silicates according to the Official Methods of Analysis of the A.O.A.C. (5). The method was modified by the addition of a 3-hr. heating period at 100° to 110°C. after evaporation to dryness on a steam bath. A modification of the McCrudden method (6) was used for the determination of calcium.

RESULTS AND DISCUSSION

Absorption and Retention of Calcium from Spinach

The mean calcium intake of the six subjects during the basal period was 820 ± 3.7 mg. per day (Table 2). After the addition of spinach containing 160 mg. calcium, the intake rose in Period II to 975 ± 5.4 mg. per day and to 982 ± 3.9 mg. per day in Period III.

The mean daily calcium content of the feces for all six subjects for the first period was 673 ± 28.4 mg. and for Periods II and III was 838 ± 5.4 and 863 ± 3.9 mg. respectively (Table 2). The increase in calcium in the feces from Period I to Period II was 165 mg. and from Period I to Period III was 190 mg. Therefore, slightly more calcium was excreted than the amount (160 mg.) in the spinach but not enough to have any statistical significance. This leads to the conclusion that the spinach prevented the absorption of an amount of calcium equivalent to that in the spinach.

When the losses of calcium in both urine and feces were subtracted from the amount in the food, most of the subjects were found to have lost calcium from the body. In the basal period, the mean loss for the six subjects was 26 mg. per day. In the two spinach periods, the loss was 30 and 51 mg. (Table 2). A "t" test for the differences between the retention on the basal diet and on the diet containing spinach showed that the increased loss when spinach was added, was not significant.

The possibility must be recognized that more calcium might have been lost in the feces had the spinach been eaten in a meal which included milk, or if the spinach had been higher in oxalic acid content. The 120-gm. serving of spinach contained 0.60 gm. oxalic acid. This amount was comparable to 0.7 gm. found in the spinach served to the children studied by Bonner *et al.* (2). On the basis of dry weight, the spinach used in the present study contained 4.1 per cent oxalic acid. This is lower than a mean of 9.0 per cent found by Kohman (7) for fifty-three samples. The two values are, however, not comparable, because the spinach analyzed by Kohman was cooked and not drained while the spinach used in this experiment was blanched and drained before freezing and later cooked and drained again.

The results of this experiment regarding the effect

TABLE 2

Calcium ingested, excreted, and retained by six young women before and after the addition of 120 gm. spinach to the diet

SUBJECT	ANALYSIS	CALCIUM														
		Period I Basal Diet					Period II Spinach Added					Period III Spinach Added				
		Week 1	Week 2	Week 3	Week 4	Mean	Week 5	Week 6	Week 7	Week 8	Mean	Week 9	Week 10	Week 11	Week 12	Mean
		mg./day	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*	*mg./day*
D. D.	Food	825	826	820	828	825	979	984	983	978	981	993	988	980	989	988
	Feces	546	840	623	619	657	845	665	792	901	801	754	1056	710	838	840
	Urine	106	116	122	131	119	122	128	114	121	121	144	140	132	134	138
	Retention	173	−130	75	78	49	12	191	77	−44	59	95	−208	138	17	10
J. S.*	Food	823	823	816	822	821	970	978	976	972	974	986	982	977	985	982
	Feces	798	724	574	741	709	1126	952	609	904	898	837	1026	788	1000	913
	Urine	150	164	169	165	162	160	166	172	149	162	155	159	189	198	175
	Retention	−125	−65	73	−84	−50	−316	−140	195	−81	−86	−6	−203	0	−213	−106
B. M.*	Food	819	822	817	821	820	973	979	978	976	976	988	982	976	985	983
	Feces	682	772	698	659	703	926	800	860	814	850	622	920	797	913	813
	Urine	220	224	198	205	212	235	195	156	164	188	212	188	162	169	183
	Retention	−83	−174	−79	−43	−95	−188	−16	−38	−2	−62	154	−126	17	−97	−13
L. O.	Food	819	825	817	826	822	987	979	979	975	980	990	984	978	984	984
	Feces	613	546	695	703	639	760	788	702	866	779	831	824	775	948	844
	Urine	193	223	233	210	215	207	232	238	202	220	207	208	241	210	216
	Retention	13	56	−111	−87	−32	20	−41	39	−93	−19	−48	−48	−38	−174	−76
J. M.*	Food	812	816	810	816	814	966	972	971	954	966	980	976	970	978	976
	Feces	620	574	719	699	653	782	912	872	777	836	951	814	876	916	889
	Urine	146	146	146	144	146	140	144	142	158	146	156	151	146	132	146
	Retention	46	96	−55	−27	15	44	−84	−43	19	−16	−127	11	−52	−70	−59
D. C.	Food	816	821	814	822	818	970	976	975	972	973	985	980	976	982	981
	Feces	702	672	668	669	678	854	833	898	879	866	893	844	897	880	878
	Urine	171	182	194	197	186	152	175	170	163	165	156	156	172	161	161
	Retention	−57	−33	−48	−44	−46	−36	−32	−93	−70	−58	−64	−20	−93	−59	−58
All subjects	Food					820					975					982
	Feces					673					838					863
	Urine					173					167					170
	Retention	−6	−42	−24	−35	−26	−77	−20	23	−45	−30	1	−99	−5	−99	−51

* Received spinach at breakfast in Period II and in the evening in Period III. The other subjects received spinach in the reverse order.

of spinach on calcium retention are the same as those found by Bonner *et al.* (2) for children five to eight years old. Apparently adult human beings absorb calcium oxalate no better than children. However, note should be taken of two factors present in the experiment which might have favored absorption: the lack of milk in meals containing spinach, and a content of oxalic acid which may not have been as high as the average for cooked spinach.

Calcium Requirement of the Subjects

In the basal period, the intake was 820 mg. calcium per day. Since the calcium added in spinach in the second and third periods was not absorbed, the intake might be considered as remaining the same throughout the study. The mean daily fecal losses were reported earlier in this paper. The mean daily urinary loss for all twelve weeks was 170 mg. This was almost identical with a mean of 167 mg. found in the literature by Knapp (8) for thirty-four subjects, twenty through twenty-four years of age, on intakes of 0.7 to 0.999 gm. per day. The losses in the present study varied widely from subject to subject: the lowest mean loss for a subject for twelve weeks was 126 mg. and the highest 217 mg. (Table 2). While the urinary loss of calcium was

characteristic for the individual and varied little from week to week, the fecal losses varied widely. A part of the variation in both was due to error in the division of weekly samples, an error which is much greater in fecal than in urinary division.

The mean balances were −26 mg., −30 mg., and −51 mg. for Periods I, II, and III (Table 2), respectively. Two of the six subjects were retaining calcium in Period I, but only one in Periods II and III. Subject *B. M.* continually lost less in each period so that in the last period her loss was too small to be significant. On the other hand, Subject *J. M.* continually lost more in each period. Why one subject should have progressed and one regressed in calcium retention is not known. While the mean balance for the six subjects for the three periods was negative by only 35.7 ± 46.75 mg. per day, it was significantly negative at the 0.01 level of probability according to a "t" test. This negative balance is so small that it might be considered unimportant, but this conclusion is unwarranted because subjects need to retain a little calcium to replace losses in hair, skin, perspiration, menses, and so on.

A survey of the literature was made to find the results of the balance studies made on young adults on intakes near 820 mg. McKay *et al.* (9) found that twelve subjects on self-selected diets with a mean intake of 753 mg. lost 40 mg. calcium and sixteen subjects with a mean intake of 850 mg. retained 34 mg. In the first case, 50 per cent of the individuals retained calcium and in the second case 62 per cent. Leverton and Marsh (10), many of whose balances were included in the report by McKay *et al.* (9), observed that eleven women on self-selected diets with an intake of 775 to 875 mg. calcium had a mean retention of 26 mg. Five were in negative balance. Bricker *et al.* (11) observed that seven subjects with a mean intake of 755 mg. retained 30 mg., and on an intake of 752 mg. retained 40 mg. In their two experiments four balances were negative and ten positive. Drake *et al.* (12) studied six subjects on intakes ranging from 852 to 881 mg. calcium largely contributed by milk. The mean balance was −47 mg. Of the eleven balances, five were positive and six negative. In other studies involving three or less subjects on intakes near 820 mg., a few more subjects retained calcium than lost it.

Apparently negative balances are not at all uncommon on intakes similar to the one used in this study. However, our proportion of negative balances was somewhat higher than that found by other investigators. This may have been due to chance in the selection of subjects or to some condition present in this study. One factor contributing to the negative balances may have been the concentration of nearly all the calcium in one meal. A second factor may have been a limited supply of vitamin D. While the diet presumably contained a normal amount, no vitamin D concentrate was added. The experiment was carried out in February, March, and April of 1950 in Ithaca, when the average hours per day of sunshine for the three months were 3.4, 6.1, and 5.0 respectively. A third factor may have been the season or year. McCance and Widdowson (13) found that less calcium was retained in some years than in others and less in February and March than in July and August. According to them, the smaller amount retained in the winter months was apparently due to something other than a deficiency of vitamin D because the addition of that vitamin to the diet did not increase the amount retained.

A fourth factor may have been the calcium to phosphorus ratio. The mean daily phosphorus content of the diet during the first period was calculated from the weights of food using values listed for phosphorus in the Department of Agriculture's Handbook No. 8 (14). The diet was estimated to contain 1060 mg. per day. Leichsenring *et al.* (15) demonstrated that on an intake of 1500 mg. calcium, an increase in the phosphorus from 800 to 1400 mg. decreased the mean amount retained by six subjects from 191 mg. to 33 mg. per day. While the phosphorus content in the diet used in the present study was higher than the calcium content, this is not an unusual situation. In fact, most diets contain more phosphorus than calcium, and the Food and Nutrition Board (1) recommends that the phosphorus allowance of the adult should be approximately one and one-half times that for calcium.

A fifth possible cause of negative balances in the case of some of the subjects may have been an intake previous to the experiment which was higher in calcium content than the one used during the study. An estimate of the calcium content of a previous diet made from the memory of subjects is far from accurate. While they remember the amount of milk they customarily drank, they do not remember the number of exceptions nor do they have any reliable way of estimating the amounts of cheese, ice cream, milk in cooked foods, and cream served on foods. The subject who reported the highest previous intake of drinking-milk was *D. C.* who drank three glasses a day. Next were Subjects *D. D.* and *L. O.* who believe they averaged between two and three glasses a day. There is little doubt that these subjects were consuming more calcium than was contained in the experimental diet. Subject *J. M.* drank more milk than *J. S.*, but as far as can be estimated both

were receiving an amount of calcium not far from that in the experimental diet. There is little doubt that Subject *B. M.* was getting less calcium than that in the experimental diet for five months previous to the study, although before that time she drank more milk.

The basis for the theory that a previous diet of higher calcium content causes negative balances lies in the results of balance experiments on low levels of intake. Several studies on Chinese and East Indian subjects and a recent one on Peruvian prisoners by Hegsted, Moscoso and Collazos Ch. (16) have shown that subjects accustomed to low intakes are able to maintain calcium balance on them. On the other hand, subjects accustomed to relatively high intakes go into negative balance when placed on intakes of 200 to 400 mg. per day. In the present study, a previous diet of higher calcium content did not appear to be an important factor in the cause of negative balances because Subject *D. D.* who, according to this theory should have gone into negative balance, retained calcium and the two subjects, *B. M.* and *J. S.*, who should not have gone into negative balance, had the deepest negative balances.

From the standpoint of requirement, the small negative balances found in this study are amenable to two interpretations. If the theory is accepted that the way to find the requirement of calcium is to find the intake at which subjects with good stores retain enough to cover the small losses in hair, nails, and so on, these subjects did not have a large enough calcium intake. Possibly the subjects might have retained enough on this same intake at another season of the year or if the calcium had been distributed more evenly in the meals. However, if the intake of 820 mg. was so near the borderline that some condition which might normally occur could render it inadequate, then a higher intake is advisable for optimal nutrition. The other interpretation of the results is that, if negative balances occur while subjects are adjusting to a lowered intake, the findings in this study have no bearing upon the requirements of the three subjects who had been living on higher intakes of calcium than the one used during the experiment. The authors favor the first interpretation.

Among the subjects wide differences in the amount of water used for drinking were noted. However, neither the volume of water intake nor the volume of urine, which might have given an approximate estimate of water consumption, were measured. All urine samples were brought to a volume of 1800 ml. except for those of Subject *L. O.*, whose volume usually ran between 2 and 3 liters, and for those of Subject *D. D.*, whose volume sometimes reached 2 liters. On the other hand, the volume excreted by Subject *J. S.* seldom exceeded ½ liter. The daily value for food-calcium minus fecal-calcium was greatest in the cases of Subject *L. O.* (174 mg.) and *D. D.* (165 mg.) and least in the case of *J. S.* (86 mg.). This may have been fortuitous but is mentioned here because it suggests the possibility that a low water intake may affect calcium absorption adversely.

Correlation between Fecal Calcium, Iron, and Nitrogen

Because calcium and iron both form many insoluble compounds and because the solubility of these compounds is affected by the acidity of the upper part of the digestive tract, one would expect their absorption to be correlated. The variation in the fecal content of these elements would largely depend on variations in the amount absorbed. The coefficient for the correlation between the fecal content of calcium and iron for each subject for each week was 0.83, a correlation of high statistical significance. Because nitrogen is excreted largely in the urine and is not affected by some of the factors that affect calcium absorption, a close correlation would not be expected between the absorption of these two elements. The coefficient for the correlation between the fecal content of calcium and nitrogen was 0.43. While this correlation is much poorer than the correlation between calcium and iron, it is high enough to be significant at the 0.01 level of probability. Apparently 69 per cent of the variability in the absorption of calcium was due to factors common to calcium and iron while only 18 per cent of the variability was due to factors common to calcium and nitrogen.

SUMMARY

Six young women were maintained for twelve weeks on a rigidly controlled diet. For four weeks they consumed a basal diet; then for eight weeks a 120-gm. serving of spinach containing 0.6 gm. oxalic acid and 160 mg. calcium was added. By calculation, the basal diet was found to contain 1060 mg. phosphorus. The experiment was conducted in February, March, and April, and no concentrated source of vitamin D was added. All milk and cheese in the diet was eaten at noon. The spinach was served for four weeks with the breakfast and for four weeks in the evening.

Analysis for calcium was made on the feces, urine, and duplicates of the food. On the basal diet, the mean intake of calcium for the six subjects was 820 ± 3.7 mg. per day. After the addition of spinach,

the intake rose to 975 ± 5.4 mg. for four weeks and then to 982 ± 3.9 mg. in the last four weeks of the experiment. On the basal diet, two subjects retained calcium; after the addition of spinach only one subject retained calcium. The mean daily balance on the basal diet was −26 mg.; on the diet containing spinach, it was −30 mg. for the first four weeks and −51 mg. for the second four weeks.

The addition of spinach to the diet did not alter significantly the calcium balance. Consequently, the conclusion was drawn that an amount of calcium equivalent to that in the spinach failed to be retained.

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Possible Toxic Effect of Soybean Oil Meal

Recent observations indicating that soybean meal defatted by the trichloroethylene process may have toxic effects on cattle and sheep have led to the preparation of a statement by the Council on Foods and Nutrition of the American Medical Association. Because it is not known whether the unidentified toxic agent accumulates in animal tissues and milk to be passed on to human beings, further study is recommended.

In the preparation of animal feeds, the oil of the soybean is removed either by pressing or by extraction with fat solvents. Naphtha has been widely employed as a solvent, but during the last few years the use of trichloroethylene has been introduced in a number of small plants because it is relatively non-flammable and requires fewer operational safety measures than naphtha.

Soon after this practice was introduced in this country, reports were received of cases of a hemorrhagic disease in cattle known to have been fed rations containing meal processed by this method. The observations were similar to those made in other countries where trichloroethylene has been used.

It has been possible to produce the disease experimentally in cattle. On the other hand some experiments show that the meal has been well tolerated by cattle fed as much as 3 lb. a day for 200 days. Evidently, not all lots of the product have the same effect.

Indications are that the meal obtained by the trichloroethylene process contains an agent that is toxic to some species, although it has not yet been identified and therefore cannot be tested chemically. It appears to be transmitted through the bovine placenta, but knowledge is lacking about its possible further accumulation in animal tissues and milk. Residual trichloroethylene as such is apparently not responsible for the effects. Until the agent is discovered and measures for its control and prevention are assured, the subject remains a practical problem. Fortunately the trichloroethylene process was never widely used and its production has now been almost completely suspended.—*Abstracted from: J.A.M.A. 149: 760 (June 21), 1952.*

Effect of Orange and Lime Juice on Calcium Metabolism[1]

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DUE to the importance of calcium in the organism and because of the problems associated with the attainment of dietary adequacy, many nutritional investigations have been devoted to the various aspects of calcium metabolism. The present experiment was conducted to determine the effect of fresh California navel orange juice and of fresh lime juice on the utilization of food calcium in the growing female albino rat. Similar studies have been made with fresh Florida non-Valencia orange juice (1), fresh California lemon juice (2), fresh California grapefruit juice (3), and commercially canned tomato juice (3).

Lanford (1) fed growing albino rats the Sherman Diet A or Diet 16 as the basal ration and supplemented it daily with 5 ml. Florida non-Valencia orange juice. The basal diet contained 0.205 per cent calcium and consisted of 5 parts ground whole wheat, 1 part dried whole milk, and sodium chloride equivalent to 2 per cent of the weight of the wheat. An increased calcium retention, which averaged about 8 per cent, was observed in the orange juice-fed animals.

Mallon and Lord (2) investigated the effects of a daily supplement of 5 ml. fresh California lemon juice on female albino rats during the period of rapid growth. Their basal diet was also the Sherman Diet A, which yielded 0.166 per cent calcium. The lemon juice did not significantly affect the calcium retention.

Mallon and Rosenblatt (3) performed a similar experiment wherein fresh California Marsh grapefruit juice was fed to female albino rats between twenty-four and sixty days of age. The basal diet (Sherman Diet A) contained 0.18 per cent calcium. The daily supplement of 5 ml. grapefruit juice increased the calcium retention by about 7 per cent.

The same investigators (3) also studied the effect on calcium metabolism when the Sherman Diet A (0.19 per cent calcium) was supplemented daily with 5 ml. commercially canned tomato juice. They reported that the tomato juice neither increased nor decreased the calcium retention in growing female albino rats.

EXPERIMENTAL PROCEDURE

The animals used in the present investigation were twenty-eight-day-old female albino rats of a modified Wistar strain. Until they were twelve days old, the young and their mothers had been maintained on the Sherman Diet B, which consisted of ⅔ ground whole wheat, ⅓ whole milk powder, and sodium chloride to the extent of 2 per cent of the weight of the wheat. Thereafter they were given a stock diet. This consisted of approximately 14 pt. of each of the following: coarsely ground Ace-High Rabbit Pellets, coarsely ground wheat, coarsely ground hulled oats, and whole wheat flour. To these were added 7 pt. nonfat dry milk solids, 1 pt. calcium carbonate, and 1 cup salt.

The animals were carefully selected so that the weight of the litter-mates would be similar. The animals were weaned at twenty-three or twenty-four days of age, and each litter of weanling rats was placed in a separate cage and continued on the stock diet until the beginning of the experimental period, at which time they were twenty-eight days old. All members of each of the six quartets of litter mates were distributed by lot so that one animal served as a control, a second was placed on the orange juice regimen, a third on the lime juice regimen, and the fourth was sacrificed immediately for the purpose of determining the calcium content of the carcass at twenty-eight days of age. Rats *1*, *2*, and *3* were included in litter-mate Trio I; rats *4*, *5*, and *6* were included in Trio II, and so on through litter-mate Trio VI. Both the control and experimental rats were fed until they were sixty days old, when they were sacrificed for calcium analysis.

[1] Presented by Evelyn M. Jones in partial fulfillment of the requirements for the degree of Master of Science. Received for publication April 4, 1952.

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All of the rats were individually housed in heavy galvanized wire mesh cages (Army Medical School design) which were sufficiently large to permit free movement. The rats rested on galvanized wire mesh floors and were not provided with bedding. The floors were about 2 in. above removable galvanized trays designed for catching the feces. The trays were lined with paper to facilitate cleaning, and when the paper linings were changed periodically, all food which had dropped through the bottoms of the cages was separated from the feces and saved. As a further precaution against loss, large sheets of black glazed paper were placed underneath the cages to catch any food particles which might be scattered outside. Although the total amount of food scattered through the floors or outside of the cages was very small, all consumption records were appropriately adjusted in order to determine the exact dietary intake of each rat. The cages were kept in two tiers, sufficiently far apart to allow free circulation of air. The room had southern and western exposures, and the animals were protected both from drafts and direct sunlight.

The Sherman Diet A or Diet 16, used as the basal ration, consisted of 5 parts ground whole wheat and 1 part dried whole milk, with added sodium chloride equivalent to 2 per cent of the weight of the wheat. It was supplemented daily by portions of either fresh California navel orange juice or fresh lime juice.

The orange juice was extracted from fruit obtained from the subtropical horticulture orchard of the College of Agriculture of the University of California, Los Angeles. The oranges were approximately 200 in size and possessed a sugar-to-acid ratio which averaged about 9:1. The twenty-one-year-old trees were of the Washington navel variety, the standard navel variety in California. The trees were budded on sweet orange root; were growing in a deep, fertile, medium loam soil; and had received an adequate allotment of fertilizer (about $2\frac{1}{2}$ lb. nitrogen per tree per year) supplied equally in commercial fertilizer and in dairy manure.[3]

Sufficient orange juice for the entire experiment was extracted immediately after the oranges were picked. The juice was hand-reamed on a glass reamer and strained into a large glass container through a wire sieve covered with two thicknesses of cheesecloth which had been dampened with distilled water. After all of the juice had been collected, it was thoroughly mixed and samples were removed for calcium analysis. The remainder was placed in small amber bottles fitted with new plastic screw caps. Each bottle contained an amount of juice sufficient for one day's supply for the rats. The juice was frozen immediately and was maintained at a temperature of $-14°$ to $-15°$C. until just prior to using, when it was thawed by placing the bottles in a pan of water at room temperature.

The limes were purchased on the open market in Los Angeles. They had been held under refrigeration and were fresh and juicy. Their diameters ranged from $1\frac{1}{4}$ to $1\frac{1}{2}$ in., and their weights from 30 to 43 gm. The lime juice was prepared and stored in the same manner as was the orange juice.

The basal diet was kept before the animals except during the periods in which the juice supplements were fed. Distilled water was available at all times. All food offered was weighed, and the quantity consumed was recorded daily, including Sundays.

In addition to the basal diet, the juice supplements were fed seven days a week. Thus the animals in the orange juice study received a daily allotment of 5 ml. orange juice, and in the lime juice study 5 ml. lime juice. Each juice supplement was pipetted into a weighed amount of basal diet expected to be consumed during the night. Each rat's portion was stirred with a small glass rod, and distilled water was added as needed to produce the proper sticky consistency which would prevent the rats from picking up bits of the food and juice mixture, carrying them about the cages, and dropping pieces through the mesh floors. The juice-supplement mixture feedings were offered in the late afternoon, at which time the basal rations were removed from the cages and were not returned until the juice-supplement mixture feedings had been eaten.

In most instances the rats readily consumed the juice-supplement mixture feedings. However, at the beginning of the study, when the rats were first changed from the stock diet to the experimental diet, some of the young animals did not entirely consume the daily allotment of juice in the 24-hr. period. This occurred only twice in a total of 186 orange juice feedings, and four times in the same number of lime juice feedings. In these six cases, the new allotment of juice and basal diet was mixed with the remnant of the previous feeding, and in all cases the total juice servings were eventually consumed.

Food was withheld from the rats for 24 hr. prior to the sixtieth day of age, when they were weighed and chloroformed. Even though the animals had been fasted, the gastrointestinal tracts were removed since they contained some food. If this had not been done, a large and variable source of error would have been introduced. The net body weight (Table 1) was considered to be the final live weight minus the weight of the gastrointestinal tract and its contents.

After the net weight of each sixty-day-old animal was determined, the carcass was placed in a large crucible, dried, charred, and finally ashed in an electric muffle furnace at a dull red heat until a white ash of constant weight was obtained. Triplicate 10-ml. aliquots of the dissolved ash were analyzed for calcium by the volumetric modification of the McCrudden (4) method with the *p*H value adjusted ac-

[3] Information received from A. H. Wright, Principal Superintendent of Cultivation, College of Agriculture, University of California, Los Angeles.

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cording to Shohl and Pedley (5). Triplicate samples of the basal diet, of the constituents of the basal ration, and of the orange juice and the lime juice were similarly analyzed. Chemically pure sodium chloride used in the basal diet was also analyzed for calcium and was found to contain an insignificant amount. U. S. Bureau of Standards weights, volumetric flasks, and pipettes were used. All chemicals were of chemically pure quality and met the standards of the American Chemical Society for purity. All water used in the analyses was redistilled through glass.

The calcium retained as the percentage of the calcium intake (Table 1) was determined by dividing the milligrams of calcium retained during the experimental period by the milligrams of calcium consumed during the same interval and multiplying by 100. In the case of Rat *1*, 373 mg. (calcium retained during the study) was divided by 507 mg. (the calcium consumed during the experimental period) and multiplied by 100 to yield 73.6 per cent calcium retention.

The amount of calcium retained by either a control or an experimental animal between twenty-eight and sixty days of age has been defined as the difference between the amount of calcium analyzed in the carcass at sixty days and the amount of calcium estimated to have been in the animal at twenty-eight days of age. To continue with Rat *1*, the amount of calcium retained was 373 mg., or the difference between 663 mg. (the calcium actually analyzed in the sixty-day-old carcass) and 290 mg. (the amount of calcium estimated to have been present at twenty-eight days of age).

In estimating the calcium content of the animals at twenty-eight days of age, it was assumed that their calcium level was the same as that of their litter mates sacrificed at that time. After the net body weights of the sacrificed animals had been determined, the carcasses were analyzed for calcium content in the same manner as in the case of the sixty-day-old rat previously discussed. The weight

TABLE 1

Effect of fresh orange juice and of fresh lime juice on calcium metabolism in female albino rats between the ages of 28 and 60 days

RATS	DIETARY REGIMEN	INITIAL LIVE WEIGHT	FINAL LIVE WEIGHT	FINAL NET WEIGHT	BASAL DIET CONSUMPTION	JUICE CONSUMPTION	TOTAL CALCIUM INTAKE	BODY CALCIUM AT 60 DAYS		CALCIUM RETENTION	
								Total weight	Percentage of net weight	Actual	Percentage
		gm.	*gm.*	*gm.*	*gm.*	*ml.*	*mg.*	*mg.*		*mg.*	
Trio I											
1	Control	40.8	98.3	87.3	269.9	—	507	663	0.76	373	73.6
2	Orange juice	38.8	112.5	102.2	295.7	155	573	779	0.76	505	88.1
3	Lime juice	40.6	101.6	91.6	257.0	155	497	688	0.75	400	80.5
Trio II											
4	Control	44.0	113.0	103.7	348.9	—	656	859	0.83	544	82.9
5	Orange juice	43.0	113.5	104.2	297.1	155	576	756	0.73	449	78.0
6	Lime juice	46.1	113.6	103.9	307.8	155	593	832	0.80	500	84.3
Trio III											
7	Control	45.7	153.5	137.8	418.4	—	787	1040	0.75	711	90.3
8	Orange juice	41.4	126.5	114.0	325.3	155	629	852	0.75	558	88.7
9	Lime juice	45.7	115.3	102.7	293.1	155	565	794	0.77	465	82.3
Trio IV											
10	Control	43.3	117.2	105.1	310.9	—	585	842	0.80	532	90.9
11	Orange juice	42.4	131.9	116.9	365.6	155	704	938	0.80	636	90.4
12	Lime juice	41.5	118.5	107.4	316.3	155	609	836	0.78	541	88.8
Trio V											
13	Control	39.7	117.2	104.6	304.2	—	572	784	0.75	503	87.9
14	Orange juice	41.0	117.6	103.9	307.1	155	594	813	0.78	522	87.9
15	Lime juice	39.6	116.1	105.3	288.7	155	557	767	0.73	487	87.4
Trio VI											
16	Control	40.1	112.1	102.1	282.7	—	532	768	0.75	484	91.0
17	Orange juice	41.6	142.3	126.1	351.6	155	678	884	0.70	588	86.7
18	Lime juice	42.8	133.2	118.1	337.8	155	649	897	0.76	591	91.1
Mean of controls		42.3	118.6	106.8	322.5	—	606	826	0.77	524	86.1
		±2.1*	±11.7	±10.3	±40.8		±76	±88	±0.03	±71	±5.2
Mean of orange juice rats		41.4	124.0	111.2	323.7	155	626	837	0.75	543	86.6
		±1.0	±9.5	±7.8	±23.8		±45	±54	±0.03	±51	±2.9
Mean of lime juice rats		42.7	116.4	104.8	300.1	155	578	802	0.76	497	85.7
		±2.2	±6.3	±5.4	±20.5		±39	±53	±0.02	±47	±3.4

* Standard deviation.

of the gastrointestinal tracts plus contents averaged 4.6 gm. for the sacrificed rats. The mean percentage of calcium in the net body weights was 0.80 per cent.

The net body weight at twenty-eight days of the sixty-day-old rats was estimated by subtracting the average weight of the digestive tract plus contents of the sacrificed twenty-eight-day-old rats from the initial live weights of the control and experimental animals. In the case of Rat *1*, the net weight at twenty-eight days of age was estimated as 36.2 gm., which represented the difference between 40.8 gm., the initial live weight at twenty-eight days of age, and 4.6 gm., the average weight of the gastrointestinal tract and contents of the sacrificed twenty-eight-day-old rats.

The estimated calcium content of the control and experimental rats at twenty-eight days of age was calculated by multiplying their estimated net weight at twenty-eight days of age by the average amount of calcium in the animals analyzed at that age. For Rat *1*, the estimated net weight, 36.2 gm., was multiplied by the mean per cent of calcium, 0.80 per cent, to give the product 0.290 gm., or 290 mg., which value represented the estimated amount of calcium in Rat *1* at twenty-eight days of age.

RESULTS AND DISCUSSION

The calcium content of the fresh California navel orange juice was 0.0106 per cent and of the fresh lime juice was 0.00896 per cent. The basal diet yielded 0.188 per cent calcium, of which 84 per cent was contributed by the dried whole milk.

The calcium retained as a percentage of the calcium intake has been presented in Table 1, which shows that the control rats averaged 86.1 $\pm$ 5.2; the animals fed the orange juice supplements, 86.6 $\pm$ 2.9; and the animals fed the lime juice supplements, 85.7 $\pm$ 3.4.

When the control rats were compared with their litter-mate sisters on the orange juice regimen, there was an increased retention of 4.5 per cent in one case; decreased retentions of 4.9, 1.6, 0.5, and 4.3 per cent in four other cases; and no difference in the remaining pair. Comparing the control and the lime-juice-fed animals similarly, there were increased retentions of 6.9, 1.4, and 0.1 per cent in three of the cases and decreased retentions of 8.0, 2.1, and 0.5 per cent in the remaining cases. No trend is apparent in these data, and the increases in calcium retention are almost completely negated by the decreases shown. Hence, it can be concluded that neither the orange juice nor the lime juice had any beneficial effect on the retention of dietary calcium.

In other calcium metabolism studies, it has been shown that fresh Florida non-Valencia orange juice (1) and fresh California Marsh grapefruit juice (3) had beneficial effects on calcium retention, whereas fresh California lemon juice (2) and commercially canned tomato juice (3) were ineffective.

All of these juices, as well as the two juices used in the present study, have two outstanding constituents, namely citric and ascorbic acids. Both of these acids have been studied independently and have been found to have no effect on calcium retention. Lanford (6), using daily supplements of citric acid and potassium citrate in quantities equivalent to the amount supplied by 10 ml. orange juice, concluded that citric acid and/or mixtures of its salts were not the calcifying agents active in the orange juice study previously reported. Henry and Kon (7) have demonstrated that ascorbic acid is unrelated to calcium retention in the rat.

SUMMARY

The effects of fresh California navel orange juice and of fresh lime juice on calcium metabolism were studied in six litter-mate trios of growing female albino rats between twenty-eight and sixty days of age. One rat of each litter-mate trio was given a daily supplement of 5 ml. fresh orange juice, a second rat received a daily supplement of 5 ml. fresh lime juice, and the third was used as a control. Neither the fresh orange juice nor the fresh lime juice increased or decreased calcium retention as compared with the control animals.

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Live Longer, Land Harder?

Blackstrap molasses, according to *Restaurant Management*, has a new use—as an ingredient in a paving material developed for the Marines. The recipe, nowhere to be found in the works of Gayelord Hauser, consists of the "wonder food" plus fuel oil, blended with sand or gravel. This yields material hard enough for military equipment to use during amphibious landings.

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Editorial

EDUCATION OF DIETITIANS IN VARIOUS COUNTRIES

Report of the First International Congress of Dietetics

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As stated in the editorial in the September issue of the JOURNAL, four afternoons of the First International Congress of Dietetics were spent in discussing the dietitian and her problems. Two of these sessions were devoted to her training. Representatives from fourteen countries participated formally and others took part in the discussions which followed the presentation of papers. On the other two afternoons, the employment of the dietitian in the hospital, clinic, public health service, schools, and other fields was presented by selected dietitians from thirteen countries. These presentations were helpful in interpreting the various programs, since it may be assumed that job opportunities are an outgrowth of the degree of competence engendered by training.

One's first impression was that dietetic education is so different in different parts of the world that there would be little hope of a common meeting ground. However, as the days went by, certain basic similarities and differences began to emerge, making possible at least a partial description of the training in the various countries. Since the members of The American Dietetic Association are familiar with the details of education and experience required for membership in our Association, these requirements will be used as the basis for reference in the following discussion.

STANDARD-SETTING BODIES

One of the first points of difference in the status of the dietitian which is fundamental, since it determines the basic standards of accomplishment to be gained in training, is the group which sets the standards for training or certifies the qualified dietitian. In many countries the state government controls either the curriculum of the training school or the examinations required, or maintains a state registration. Certain of these countries also have associations of dietitians, but the associations accept into membership the dietitian who has passed the state standard in much the same way that The American Dietetic Association and the Canadian Dietetic Association accept the degree conferred by an accredited college or university. In these countries there would appear to be considerable divergence in the degree to which dietitians individually, or as an organization, have a voice in the development of the training or examinations for certification. Austria and Germany, for instance, have laws which restrict both the applicants for dietetic training and the working conditions of the dietitian in such a way that competent applicants are discouraged from entering the field, or must enter after nurses' training has been completed.

On the other hand, state controlled examinations in Great Britain and the Netherlands and state registration in New Zealand have apparently developed in cooperation with the various associations of dietitians and not only do not conflict with their standards or philosophy, but the dietitians are instrumental in setting and maintaining those standards. Canada and the United States would appear to be unique in that the standards are set by the association of dietitians in each country. In some other countries, no clear-cut procedure for establishing standards was defined.

BASIC EDUCATIONAL FACILITIES

Another aspect of training which would appear (at least from the American point of view) to be essential for the development of a well-rounded dietitian would be the availability of a basic educational program in science, foods, nutrition, and institutional administration. This basic education is available either as college training leading toward a degree or as training beyond the secondary school for which a diploma is earned in all those countries in which dietetics as a profession has shown a steady growth during the past twenty years.

Specialized training in dietetics, more or less equivalent to the internship in the United States, is superimposed on this basic training, although in several countries the dietetic training requires one and a half to two years and includes much of the specialized subject matter which the American dietitian studies in the fourth year of college.

It is of interest that in all of the countries which reported that the dietitian had not achieved status beyond that of a cook or kitchen supervisor, an attempt was being made to teach the specialty of dietetics in a year to two years without basic educational requirements.

It is difficult—and probably unwise—to try to

evaluate the difference between undergraduate work toward a college degree and training beyond the high school level leading to a diploma in domestic science, catering, or a similar specialty. Probably the most important difference is one of emphasis, since the college graduate has a broader and more intensive indoctrination in the sciences and less emphasis on the purely practical. When this situation exists, as in the United States, the specialized work in dietetics is an application of principles. The principal omission in the advanced training of women planning for a career in dietetics in other parts of the world as compared with similar education in the United States and Canada is the lack of work in the social sciences, education, and the humanities.

A bachelor's degree program in domestic science from a college or university may be obtained in Great Britain, Canada, Australia, New Zealand, and New South Wales. In Great Britain, New Zealand, and Australia, nurses' training or a diploma in domestic science or institutional administration from a technical school are alternate educational routes for admission to dietetics. In New Zealand, the training in dietetics requires two years and four months for the trained nurse and one year and three months for the college graduate which to some degree equalizes the scope of the total educational process for the dietitian.

The Netherlands and Sweden also have schools of domestic science and require completion of a curriculum averaging about three years for admission into dietetic training. Dietetic training, which includes both theory and practice, is taken for a year and a half to two years or until the student satisfactorily passes certain examinations. There is no doubt that the dietitians in both of these countries have a strong practical training and that they are competently filling dietetic positions both in administrative and therapeutic areas. One dietitian from the Netherlands recently qualified for the Master of Science degree in an American college with only a minimum of collateral work which is another measure of the scope of the educational pattern in comparison with that advocated by The American Dietetic Association.

DOCTORS AS DIETITIANS

Another point of interest in the development of the profession of dietetics was that in many countries where a graduate in home economics was not available for employment as a dietetic specialist, the doctor of medicine has assumed the role of therapeutic dietitian. The woman with some training in foods and diet tends then to be a combination of cook for special diets and an intermediary responsible for the actual service of therapeutic diets to patients, but with none of the responsibility for setting the standards for those diets which the American dietitian has. This dietitian tends to have no contacts with patients except to instruct them on discharge from the hospital. In certain countries, the training of the dietitian has been organized and is sponsored by the medical profession. Such training is limited to some basic science, nutrition, and therapeutic dietetics but includes almost nothing of the food preparation and managerial aspects as visualized in other countries.

SPECIALIZED AREAS OF WORK

In developing a dietary service, the most pressing problems are those of the care of the patient who requires special dietary modifications. Therapeutic dietetics was practiced in all the countries represented at the Congress. A logical corollary to the therapeutic feeding of the patient is instruction, and the next step in development of a dietary service appeared to be an increase in patient contact and growth of the outpatient clinic. Excellent clinics were observed, particularly in Great Britain where not only instruction in the special diet prescribed was included in the work, but also demonstrations of cookery, food preservation, and the principles of a good general diet. The work was presented in a very practical manner relating the specific prescription to the food ration and the family meal service. Actual food, food models, and pictures were used to illustrate the instruction. Responsibility for the entire food service was delegated to the dietitian in only a few instances outside of the United States and Canada.

An interesting point which was brought out repeatedly was that the dietitian is in demand as a member of the public health team in practically every country represented at the Congress, even in those areas where few dietitians were found in the hospitals. The public health assignment took various forms depending on the organization of the health services of the country in question, and the dietitian might be assigned to the Ministry of Food or Health. However, in practically all cases, consultation; teaching of lay groups; participation in nutrition surveys; preparation of folders, pamphlets, and publications of a popular character; and coordination of the dietitian's division with other health services were reported.

In those countries with an established basic training, the dietitian was always a member of the teaching staff in the special dietetic training, and she usually taught also in the university or technical school.

The more thoughtful and older members of The American Dietetic Association will recognize that the development of dietetics in various parts of the world is following much the same pattern it has followed in the United States. Differences are largely a matter of the degree to which the pattern has been completed. It is the opinion of your representative

to the Congress that, where training for dietetics has developed as a four- to six-year educational pattern to which only the graduates of a prescribed secondary education are admitted, the quality of the dietetic service rendered is good, irrespective of whether an academic degree has been earned. The diversity of the service may fall short of our concept of a complete dietary department, but there is a growing trend for the dietitian to accept increased responsibilities and, in many countries, the realization of this trend is limited largely by lack of numbers in the training programs. It is suggested that an interchange of dietitians with certain of these countries in the next few years could be mutually profitable and that means be sought to effectuate such exchanges.

Facts vs. Quackery about Nutrition

Facts About Foods and Nutrition, recently issued by Utah State Agricultural College, is a bulletin calling attention to the serious problem of fraudulent food propaganda.

"Some fail to stop at the red light," it is noted in the bulletin. "Health" foods are in demand, although both the Food and Drug Administration and the Council on Foods and Nutrition, American Medical Association, emphatically condemn the improper use of the word "healthful" and similar expressions. The Food and Drug Administration's statement follows:

> The use of the word health in connection with foods, constitutes a misbranding under the Food and Drug Act. The use of this word implies that these products have health-giving or curative properties, when in general, they merely possess some of the nutritive qualities to be expected in any wholesome food product. The label claims on these products are such that the consumer is led to believe that our ordinary diets are sorely deficient in such vital substances as vitamins and minerals, and that these so-called health foods are absolutely necessary to conserve life and health.

A similar statement has been made by the Council on Foods and Nutrition:

> The term health food and equivalent claims or statements to the effect that the food gives, or assures health are vague, misinformative and misleading. An adequate or complete diet and the recognized nutritional essentials established by the science of nutrition are necessary for health, but health depends on many other factors than those provided by such diet, or nutritional essentials. No one food alone is essential for health. There are no health foods.

Legal controls available for printed matter cannot, unfortunately, be applied to propagandists from the lecture platform, over the radio, on television, and over the counter. The reliance which sick people, who should be seeking competent medical advice, place on these nostrums is quite frightening.

The sales campaign designed to promote the sale of special "health foods"—usually involving high costs—is especially serious in these days of rising food costs. All too often, family food budgets are pared down to buy pills, powders, and "special health foods" at the expense of a wide variety of wholesome and nourishing foods required for an adequate diet as determined by modern scientific standards. Often the high-pressure selling in which these nutrition quacks indulge frightens people into believing that a diet of common ordinary foods is inadequate and must be supplemented with fancy preparations.

Perhaps even more serious as a health menace growing out of the extravagant claims advanced by these propagandists is the tendency to promote the use of unbalanced diets. The Utah bulletin notes specifically the following diets: (a) without milk; (b) using raw milk; (c) using small amounts of yogurt to replace other forms of milk; (d) without meat; and (e) without eggs. An interesting point is that the raw-milk advocates frown on pasteurization but use dried milk which is processed at a temperature about 50°F. higher than is used for pasteurizing.

Food fads which are probably harmless from a nutritional standpoint, but which involve needless expenditure of time and money, include the use of only freshly home-ground wheat (white flour, according to the faddists, is poison and causes alcoholism); use of raw sugar and blackstrap molasses; use of a liquid-vegetable diet; brewer's yeast as the main source of thiamine; utilization of vitamin concentrates rather than natural foods for vitamin supplies; rejection of aluminum cooking utensils as "unsafe"; and the use of home-grown bean sprouts.

Federal and state regulations cannot deal adequately with these problems. Only through a vigorous educational program will the public at large become aware of the falsity, and even danger, in the extravagant claims of so-called "food experts." Here is a job in the field of public health which is urgent.—*From: Am. J. Pub. Health 42: 997 (August), 1952.*

Current Comment

NUTRITIONIST POSITIONS IN PUBLIC AND PRIVATE HEALTH AGENCIES[1]

GERALDINE PIPER

Diabetes Branch, U. S. Public Health Service, Federal Security Agency, Washington, D. C.

The American Dietetic Association has been aware of the increased demand for qualified nutritionists to work in agencies and organizations whose major objective is giving health services and/or performing health research.

The purpose of this survey was to obtain information about the number of nutritionists employed in public and private health agencies in 1950; the number of established (budgeted) but unfilled positions in those agencies; and the type of health agencies employing nutritionists. Interest in the number of qualified nutritionists needed to fill positions in public and private health agency work has been expressed by persons in colleges and universities who are concerned with training public health nutritionists. It is hoped that this survey will be helpful to this group as well as to all members interested in vocational guidance.

METHOD

A questionnaire was developed, and a preliminary test of the questionnaire sent to ten public and private health agencies. Questionnaires were then sent to the Community Nutrition Chairmen of all state and territorial dietetic associations, who were responsible for forwarding them to the agencies concerned in their states or territories. The instruction sheet included definitions to clarify terms. It was difficult to arrive at definitions of terms which lent themselves to similar interpretations by all persons answering the questionnaires. This was reflected in the information received. The questionnaire sought to determine: (a) name, address, classification of agency, and geographic area served; (b) primary function of the agency; (c) budgeted positions established in the agency for nutritionists in 1946 and in 1950; (d) number of nutritionists employed in 1950 with a list of names, year appointed, and full-time or part-time employment; (e) classes of positions established and the academic training and experience required in each; (f) reasons for decrease (if applicable) in number of positions; and (g) number of vacancies and reasons for unfilled positions.

RESULTS AND DISCUSSION

One hundred forty-seven questionnaires were returned. Of these, 124 were from public and private health agencies classified as follows: 75 from official (public) health agencies, which included state, district, county, and city health departments, and the U. S. Public Health Service and Children's Bureau; 44 from private, quasi-governmental, and federated health agencies, such as visiting nurse services, nutrition councils and commissions, tuberculosis and heart associations, Metropolitan Life Insurance Society, American Red Cross, and others; 5 from medical schools and hospitals; and 23 from other types of official and non-official agencies.

In this survey the committee did not classify the following replies as being from agencies whose primary function is to provide health services and/or perform health research:

- 3 from state Departments of Welfare
- 6 from Dairy Councils
- 8 from state Agricultural Extension Services and Experiment Stations
- 2 from state Departments of Education
- 2 from state Departments of Mental Hygiene
- 2 universities (1 providing community nutrition training, the other providing specific health service in the community).

The number of budgeted positions for nutritionists in health agencies increased from 230 positions in 1946 (2 of which were part-time positions) to 304 positions in 1950 (4 of which were part-time positions). Positions in the public health agencies had increased, while those in the private health agencies had decreased. The major reasons for decrease were: budgetary reduction; lack of well qualified persons to fill positions; reorganization of work reducing the number of nutrition positions; and low salaries which impeded employment of qualified workers.

It was difficult to arrive at the number of agencies having clearly defined job specifications with established academic training and experience requirements. Of the budgeted positions for nutritionists, there appeared to be three classes of positions most commonly established. The types of positions established depended on the complexity and extent of the agencies' nutrition program. The titles for the classes varied considerably. In the top category, they were:

[1] Report of Community Nutrition Project #3, 1950–52, The American Dietetic Association—Ansta Barr, Mary Ross, Chedwah van Tijn, and Geraldine Piper, Chairman.

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*Eggnog nutritive values from Bowes, A. de P., and Church, C. F.: Food Values of Portions Commonly Used, ed. 7, Philadelphia, College Offset Press, 1951.

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supervisor, director, chief, principal nutritionist, or senior nutrition consultant. In the second echelon, there were nutrition consultants or nutritionists. The third class included staff nutritionists or nutrition workers. It was apparent that many agencies have established a fourth class called dietary consultant, dietitian, hospital consultant, or institutional nutrition consultant.

The academic training and experience required varied with the class. In many returns, the years of experience required to qualify for the position were not stated clearly. It is believed that in many cases the experience stated represented the years the person now holding the position has or had when accepting the position rather than experience required to qualify for the position. In most cases, the top class required a bachelor's degree in foods and nutrition and a master's degree in nutrition with four years of experience in a health or welfare agency. The step below the top class required a bachelor's degree in foods and nutrition, one year of graduate work, and two years' experience in a health or welfare agency. The third class usually required a bachelor's degree and one to two years of experience (one year of graduate work might be substituted for one year of experience). The special consultant, or fourth class, required a bachelor's degree in foods and nutrition or institutional management, a dietetic internship, and two to three years' experience in a hospital or quantity food service. It was noted that in some agencies the special consultant was required to have a master's degree in institutional management or foods and nutrition in addition to the above requirements. Of the 304 nutrition positions, 47 required a dietetic internship, and it was stated as being desirable for 11 others.

During 1950, 35 nutritionists received appointments to full-time positions with public health agencies and 9 with private health agencies; 4 part-time positions were filled. There was a turnover of 14.2 per cent and 15.9 per cent of full-time workers in the public and private health agencies respectively.

At the time of the study, the returns on 124 questionnaires showed 36 existing vacancies. Inadequate salaries were given for the reason for vacancies by 14 agencies, and 10 agencies listed lack of well qualified persons as the cause. Restrictive residence requirement was another cause given.

The committee recognizes that this report represents only a rough estimate of positions in public and private health agencies, since it is based on only the 124 questionnaires returned. The returns were incomplete. However, these data do corroborate the need for recruiting and training nutritionists for public and private health agency work.

SUMMARY

In the 124 health agencies returning questionnaires, there was a 31.6 per cent increase in the demand for nutritionists between 1946 and 1950—from 230 budgeted positions in 1946 to 304 in 1950. At the time of the study, there were 36 vacancies, all of which were full-time positions with public agencies except one part-time position with a private agency. It is apparent from the study that the leading causes of vacancies are the lack of well trained and qualified persons and inadequate salaries. It appears there is a need to develop a plan for recruiting persons with basic academic requirements into this relatively new field of work. Also, there is a need to provide areas in which the inexperienced person who wants to enter the field may receive supervised experience in order to qualify for staff positions. It would seem reasonable and valuable to study and evaluate the salary scales for nutritionists' positions with those of allied fields where academic training, experience, and duties are comparable. Such a study might lead to further action for improving present salaries.

DIETITIANS—SUPPLY AND DEMAND[1]

E. EVELYN SMITH

Associate Professor and Chairman of Divisions, Institution Management, University of Illinois, Urbana

In our profession, we all realize that the demand of dietitians is out of line with the supply. In fact, we either have a patient with a disease of epidemic proportions, or we think we have. We could label this disease from which our profession seems to be suffering "Supply and Demand." In every phase of dietetics, from every state and from every school, we hear reports of this epidemic. When a disease reaches epidemic proportions, citizens, medical men, health authorities, and others attack the problem and make every effort to find the cause, cure those who are ill, and make plans for the future to insure against another attack. Let us think of ourselves as a similar group of specialists, trying to analyze, treat, cure, and immunize our patient so that he may enjoy continued robust health.

Let's start our curative program by looking at the symptoms. We surely have a shortage of dietitians in relation to the demand, but are there fewer dietitians or have we created a demand—a Frankenstein—which seems at the moment to overpower us? No doubt we should double our supply annually to keep up with the requests coming to us but we are unable to do this.

Our profession has done a fine job to be so well recognized in such a short span of years, but we are faced with the fact that we cannot hope to keep up with this demand for some time to come. If I

[1] Presented before the Missouri Dietetic Association in St. Louis, on April 18, 1952.

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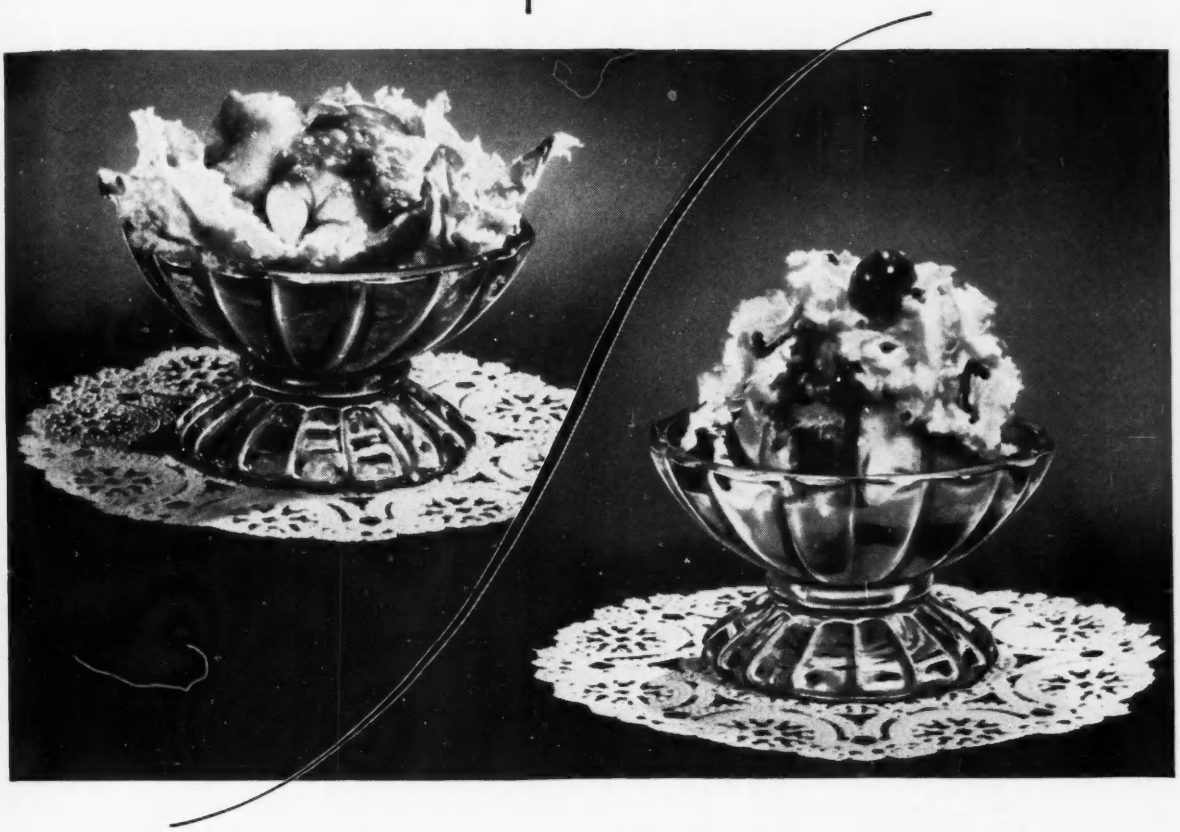

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could graph the picture for you, we would see that the demand has consistently been higher than supply. In the past years, while the number of dietitians has increased to some extent, the demand has more than doubled. Hence we have reached the point where the law of supply and demand begins to function. When supply is low and demand is high, we either must produce more, get higher prices, become more selective, or find substitutes. We will try to explore some of these points.

TRENDS IN SCHOOL ENROLLMENTS

In trying to increase the supply, perhaps our first task is to interest more students in taking home economics, hoping that then they will decide that dietetics—the career with a choice—has much to offer them.

We often hear it stated that there has been a drop in enrollment in home economics departments and colleges. If we look at the long-term picture, however, we find that except for the past few years, there has been a gradual but consistent growth over a period of thirty years. For instance, the University of Washington reports its home economics majors as follows:

Before 1920	250
1920–30	435
1931–40	587
1941–51	612

This, no doubt, would be the history of all home economics schools, but demand in all phases of home economics has so greatly increased that the facts are lost.

It is true that home economics schools have had little increase in enrollment in the past few years, but there seem to be good reasons. Home economics and especially dietetics has had a phenomenal growth in a comparatively short time, and it is perfectly natural that it should level off for a time. Many openings in other fields have developed for women, and, compared with dietetics, the newer positions seem more glamorous, and in many cases easier to achieve in a girl's brief working life. We hope this is a temporary situation. Perhaps we have been too rigid in requirements, but we surely do not want to lower our standards.

Another factor affecting our enrollment, especially in the junior and senior year, which has caused a shortage of those entering dietetics, is that due to war conditions, Cupid has been very active. Times have changed greatly; we accept the fact that we have engaged girls, married women, and even expectant mothers in our classes. It has been rather comforting to me, however, that those who do go on to an internship and get some feel for the profession are anxious to continue in dietetics for at least a few years after marriage.

An interesting study which helps to explain some of our problems was made by Potthoff (1). It is entitled "A Study of Enrollment in Secondary and Higher Institutions of Illinois, 1909–10 to 1975–76." It covers the past forty-one years and gives a twenty-five-year prophecy. It points out that enrollments are always affected by social and economic conditions. In 1930, the depression year, many students entered high school, but the percentage of those graduating dropped. Due to the depression, two world wars, and a cold war, there has been a decline in high school enrollment since 1931–32 for boys and since 1935–36 for girls. The year 1948–49, when 1952's seniors were freshmen, represents the bottom.

A great increase is expected during the next fifteen years as college enrollment reflects population data. In short, the decline in enrollment for women should be at an end after the school year of 1951–52, and under normal social and economic conditions, it should now begin to rise until 1968–69. Then a decline may be expected until 1975–76. Only about one-third of the women graduating from high school go to college. There are actually fewer girls in college now, but we can well ask ourselves: Are we getting in home economics a goodly share of those who come to college—and could we interest more in coming?

FACTORS INFLUENCING OCCUPATIONAL CHOICE

There is another study of significance to us as a basis for a sound and dynamic vocational guidance program for home economics students. It also contains much pertinent data that can help us in dietetics in our recruiting program. It is a recently published study made at the University of Nebraska by Elizabeth Wright and Florence Corbin (2). This study was based on the 192 returned questionnaires that were sent to freshmen and transfer students in seven Nebraska colleges. The following points are important for us:

I. *When should we recruit?* They found that:
   A. 30% became interested in home economics before high school
   B. 25% in freshman and sophomore years
   C. 28% in junior and senior years
   D. 10% after high school

   These data indicate that we must contact, influence, and start our vocational guidance programs early. And, we should adapt our approach to appeal to these younger students, if we are to start them thinking.

II. *Where should we recruit?*

   It was found that 36 per cent of those interested in home economics came from cities of over 20,000 population and 64 per cent from smaller or medium-sized towns. We need not

Patricia Collier

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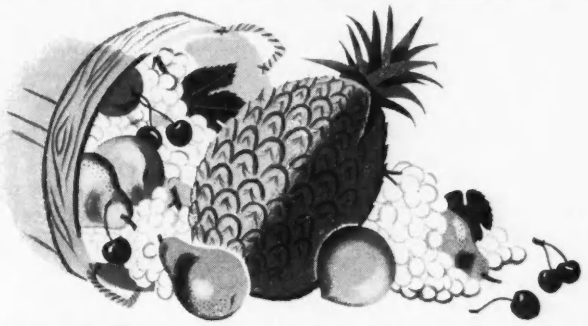

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only to contact students in these towns but all the leaders who work with youth groups in these smaller communities.

III. *What influences students to take home economics?*

A. Personal contacts

1. Relatives
   - a. Mothers 74%
   - b. Fathers 24%
   - c. Sisters 17%
   - d. Brothers 8%
   - e. Other relatives 19%

   (It is interesting to note that the mothers thought home economics was good preparation for marriage, while the fathers thought it gave financial security.) Since relatives are such important influences, the need for informing adult groups about the opportunities in home economics and especially in dietetics is obvious.

2. School personnel
   - a. Homemaking teachers 33%
   - b. Superintendents and principals 15%
   - c. Homeroom teachers 10%
   - d. Counselors 6%

   It is rather startling that so few were influenced to take home economics by the principals or counselors. Why not? Aren't they informed or interested? Have homemaking teachers the facts on opportunities in dietetics? The health, science, and other teachers seem to have had little influence, too. These groups should be contacted.

3. Contemporaries

   Students also reported being influenced by young, glamorous college students who talked to them. We could also use our attractive and enthusiastic interns for this. In fact, this is being done in some places. Between semesters this year, fourteen upperclass coeds from the University of Illinois visited high schools in their areas. They reported a fine response and good audiences. I wonder who influenced you. Do you remember? We would all agree that personal contacts played a large part in our selection of a career.

B. Newspaper clippings, essay contests with prizes, social notes about the home town girl and what she is doing in college and especially in home economics also help.

C. Activity programs

1. Homemaking at home 65%
2. Practical work in hospitals, stores, and so on 21%

   (Are we sure if they come to us that they do not become discouraged?)
3. Books and magazines 29%

   (Are these available in your towns?)
4. 4-H Club activities 22%

   (Have you contacted these leaders?)
5. Scholarships 13%

   (Do you inform your students about scholarships which are available?)
6. Hospitality day 12%

   (This activity is usually limited to an area of 50 mi. Therefore, many colleges, hospitals, and so on throughout a state should cooperate, thus giving all interested students, regardless of age, an opportunity to visit the institutions.)

IV. *What interests in a home economics curriculum were indicated?*

A. General interests

1. Homemaking 78%
2. Home decoration 57%
3. Garment construction 54%
4. Designing 34%
5. Teaching 33.8%
6. Nursery school 30%
7. Wholesale buying 22%
8. Dietetics 17.7%
9. 4-H Club work 17.7%
10. Demonstration 16.6%
11. Food research 15.6%
12. Journalism 7%

B. Professional interests

1. Teaching 33.3%
2. Homemaking 24%
3. Dietetics 10%

   (The small number interested in dietetics indicates a need for interesting and informing many people, young and old, about our profession.)

These studies point out some trends which can help us in directing our vocational guidance programs. I wish we had similar studies in our field of dietetics. Perhaps two facts stand out as significant:

(a) The need to inform and interest parents, counselors, and other adult groups about our profession.

(b) The great importance and significance of personal contacts, especially for the younger groups.

Thus two types of programs would seem to be needed: (a) formal for adult groups, and (b) informal, subtle, and glamorous for the younger ones.

ADULT GROUPS

We could ask how many mothers who have been dietitians have daughters following in the pro-

PROPORTIONED BY NATURE

To Supply Biologically Complete Protein

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Eggs For Daily Use

In an evaluation of protein for therapeutic uses as well as for the diet of people of all ages, it should be recognized that some proteins, because of their biological completeness, are more effective nutrients than others. Eggs supply such complete protein. They are easy and convenient to use...and economical.

Eggs supply all the essential amino acids necessary for growth and body maintenance. In fact, whole egg protein is often used as a standard in evaluating the nutritive value of other proteins.

Metabolic and nutritional studies continue to reveal eggs as contributors of food values for abundant health, good growth and body repair.

APPROXIMATE PERCENTAGE OF AMINO ACIDS IN EGG PROTEINS[1]
(Calculated to 16% of nitrogen)

Arginine	7.0%	Cystine	2.1%
Histidine	2.4	Methionine	4.0
Lysine	7.5	Threonine	4.9
Tyrosine	4.5	Leucine	9.2
Tryptophane	1.6	Isoleucine	7.7
Phenylalanine	6.3	Valine	7.8

[1] Block, R. J. and Bolling, D.—The Amino Acid Composition of Proteins and Foods, Second Edition, C. C. Thomas, Springfield, Ill., 1950.

This seal signifies that all statements herein pertaining to nutrition have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

POULTRY AND EGG NATIONAL BOARD
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fession. How many sisters? It would be interesting to know. How many mothers, teachers, and others have you influenced or informed? Can we say, as I heard a young dietitian say the other day, "I was the first dietitian from our high school; in fact, the teachers didn't know what a dietitian was. Now we have had four in the past year"? Her interest and enthusiasm did more than many talks could do. It is often what we do, not what we say, that counts. We cannot underestimate the real value of an enthusiastic person in making a job interesting and glamorous. If, as has been said, we return to work each day with enthusiasm no matter what happened the day before, we are in the right job and others will note it and become interested. Disgruntled, overburdened, and grouchy dietitians or ex-dietitians can do much to harm the profession.

When contacting adult groups, we will use largely the formal approach or career talks giving information, distributing literature, and answering questions. State and local groups can form speakers' bureaus so that they can avail themselves of every opportunity to meet with various groups. Perhaps it would be wise for the state associations to allot some money in their budgets for the expenses of this speakers' bureau and for literature to be distributed. In these speeches we must be careful not to "crusade" for dietetics for we can build up resistance to it in this way.

In Cincinnati, several years ago, dietitians had a successful conference and workshop for counselors to acquaint them with the profession. Try to get a spot at a teachers' meeting for a short talk; talks to P.T.A., women's clubs, Farm and Home Week groups, and others will be helpful, as are spot radio announcements. In short, "get around"—put yourself and your profession "on the map."

The informal or subtle approach can also be used to help to acquaint these groups with our work. You can win many friends for the profession by helping some women's group plan a church kitchen or a principal plan his school lunch set-up. When emergencies arise, offer your services. Have a booth at your state fair or at conventions of allied professions. If you are doing some interesting things in your department, have a news item put in the paper.

Are you sure that school libraries in your area have career kits and other informational material about dietetics? I heard of one mother who, through some indirect means, became interested in dietetics as a career for her daughter but could get no information from the schools or library in her town.

Anything that we can do to interest mothers and have "conversation pieces" will count. A mother will be attracted by notice of a lecture titled "Controlling Your Curves" or "The Food Expert Speaks." Often interesting parents in the *results* of *good* food and its importance for health and how to achieve it can be more important than talking merely about opportunities.

There is no underestimating the value of "doing a good job." We must remember that parents eat the food we serve and may become interested or not in the profession as a result of the quality of this food. What the public, the community, our guests, our co-workers, and our administrators think of us makes friends and influences people for or against our profession. By the way, have you ever had an "invite your boss for dinner" meeting?

CONTACTING YOUNG PEOPLE

In thinking of vocational guidance activities for younger groups, as I have already indicated, it is well to use a more informal, indirect, subtle, and glamorous approach, and I would like to discuss a few of these with you.

Take a high school class on a field trip to visit a hospital or famous tearoom; if the students really eat in the tearoom and collect the menus, they become interested. It will add greatly if there is an enthusiastic dietitian to talk to them. Primarily, they were interested in the tearoom rather than the profession, but that is where vocational guidance can begin. Arouse their interest in *good* food, *nicely* served.

Instead of talking to them of opportunities, salaries, and duties of dietitians, discuss such things as "styling of foods"—even the art teachers will be interested—or "Foods of Other Lands" or other glamorous subjects. Or, have a "Fun with Food Day." If we start by interesting them in food, the career talks can be slipped in incidentally.

Good food in the hospital, school lunch, or elsewhere will always result in more dietitians. Meals served while a young girl visits a patient in a hospital or her participation in a school lunch program can also be a vocational guidance aid, especially if it encourages her to meet the dietitian in charge.

Sponsoring essay contests is another way to create interest. In Illinois we conducted such a contest among 4-H girls. The winner was invited to the spring meeting of the Illinois Dietetic Association where she received her award. Her mother and the 4-H Club leader were also invited. Although the prize was given with no strings attached, this girl is planning to take the dietetic curriculum. This personal and individual approach may take longer, but, in the end, it will be effective.

I want to emphasize the need of not underselling home economics and dietetics. We should try to appeal to the *good* students who are interested in *science*.

If you hear of a girl who is interested in home economics and dietetics send her name to the home economics department of the college of her choice. They can contact her and send some literature to her mother to keep the flame kindled.

Bulletin № 3

Secrets of Serving Successful Breakfasts

Individual Packaging—immediately after processing, ten delicious varieties of Kellogg's ready-to-eat cereals are packed in air-tight individual packages. This makes it possible for you to offer a *choice* of ten delicious cereals for individual tastes . . . cut *waste* and *serving time*—be sure that each serving provides fresh Kellogg flavor. And since 80% of U. S. families use Kellogg cereals, you can count on the popularity of this choice of cereals.

*

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OVERCOMING CRITICISM

There have been some rather unfair criticisms of our profession which in a vocational guidance program you are sure to meet. Sometimes it is even a good idea to ask for objections from a group.

The work is hard. Any work that is worth doing has some elements that are hard. It is possible that some dietitians do overwork. However, if we investigate, we probably would find that the dietitian in question is overworking or unhappy because she is not managing her job efficiently. Is she planning, supervising, simplifying her work in line with modern scientific management? Is she delegating duties and doing what she is really paid to do?

Employees are of poor caliber and insufficient in number. No doubt we as a profession need to do some active recruiting for a better class of employees. To do this, better working conditions and equipment are needed, and we should glamorize food jobs for employees as well as for dietitians.

Hours are long, broken, and unattractive. Statistical studies have shown that the 8-hr. day is the average for dietitians. Of course, when people must be fed three meals a day for seven days a week, someone must be on duty. It is possible that hours could be rotated to be more desirable in some situations.

However, very few professional people have a 9-to-5 day. Do you know any? Actually the dietitian's hours may be more desirable than those in several other professions. By 10:30 in the evening, the efficient dietitian has been off duty for 3 or 4 hr. But what is happening to people in some of the other professions and occupations? A doctor enjoying a family party answers a telephone ring and must leave to attend a patient. A nurse awaits him with her thermometer and charts. At the same time, the teacher is just putting away the papers she has been grading all evening. In the amusement world, the violinist replaces his violin in its case and breathes a sigh of relief after a strenuous concert. The actress puts away her script as she goes on for the last scene. We could give many other examples.

We often forget how many people serve us at all hours of the day and night. The dietitian, being a member of a learned profession, must take her place in "service to others" *when* that service is needed. We should be able to make this adjustment as have other professional people and realize the difference between a profession and a trade.

Salaries are low. This was also studied and reported by the Bureau of Labor Statistics (3). It was found that salaries for dietitians were in line with other professions. Money cannot be our only reward for any job these days for the more we earn the less we seem to have. Other rewards and satisfactions which must come from the work itself can be found in dietetics.

There is not enough job satisfaction. Many dietitians accept jobs that are too big for them. This is especially true in small hospitals. As a result, they become frustrated. The answer to this is to do a job analysis, recruit, train, and promote key people to help carry the routine jobs so that the dietitian is free for supervision, advising, consultation, educating, training, and policy making.

Dietitians lack professional status. The manner in which the dietitian is treated depends to a large extent on the individual, her appearance, her grooming, her conduct, and her efficiency. A good dietitian rarely has this problem. If she does, she can usually correct it by proving her worth.

Dietitians move about so much. This criticism I cannot refute, for I fear it is true. Why do we not move *up* in our profession rather than move *out?* Recently a young dietitian wrote a letter saying she loved her work but wanted to do something different because "hospitals are so morbid." Why are we so unstable that we can't stay in the profession for which we are trained and which needs us? Nurses and doctors do, and they surely see the morbid side.

PERIPHERAL SOURCES OF DIETITIANS

In the beginning we said that when supply is short we must produce or recruit more. Before we do this, we must be sure that our financial and other values are in line with competitive fields. We must also see that dietitians are used well and where they are most needed. Last but not least, we may need to use substitutes to help fill the gaps.

What are some of the sources of supply toward which we can direct our vocational guidance program in addition to our high school and college students?

Reemploy retired home economists and dietitians. These people may be willing to return to work for part- or full-time after their families are grown, but we must find suitable jobs for them during the hours they can give us. Often they could be consultants for several hospitals.

However, we must be careful not to give them "flunky" jobs. During the war it often happened after we had worked hard to recruit such people, that they were sent without instruction into the kitchen to do odd jobs while the dietitian sat at her desk all day. No doubt it should have been the other way round.

Recruit subsidiary workers. Again, if we analyze the jobs, we will find that we are often doing many things for which our training is not needed and for which we are not really being paid. We need to employ and train capable workers to help with the routine and detail jobs and to carry some of the responsibilities—thus freeing the dietitians for supervision.

Recruit men. We know that there will not be enough women to meet all the demands for dietitians

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To modern Americans, the Twentieth Century does not represent a segment of time; it is an achievement in transportation. It is synonymous with modern, swift, luxurious travel. Naturally, meals on the Twentieth Century Limited must be on a par with such eminence. That they are, and deservedly so, is due in no small measure to the fact that the diner on this famous train is well stocked with Sexton foods . . . including those fine fruits which have been picked and packed especially for those who serve the public. They may cost a few cents more per can, but certainly less per serving. They are sure to satisfy the most discriminating guest.

New York Central R.R. Diner

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for many years to come. However, men are entering the food field, especially the administrative area where girls may not be interested, and the men are willing to take the necessary training. They have a real contribution to make, and we will be smart to encourage them and provide curricula in home economics suitable for them.

In summary, we must remember that "dietetics is a career with a choice." It has many angles, requiring many different skills and abilities. We can, therefore, appeal to and through a variety of people. It is our responsibility and opportunity to help the other person to see the niche which she can fill with most satisfaction, and one which offers opportunity for growth and development.

We must get the cooperation of all concerned, including ourselves, by helping, informing, and contacting as many people as possible both by formal and informal methods. We must make an effort to fill in gaps by recruiting, training, and using other workers efficiently. If we can start with a few of these suggested treatments, we can be assured that while the cure cannot be immediate, "the prognosis is good."

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FDA Policy on Fluoridated Water

Fluoridated water and foods prepared with it took their place under the provisions of the Federal Food, Drug, and Cosmetic Act on July 22. The Food and Drug Administration's statement of policy, as published in the Federal Register, July 23, 1952, reads:

"STATUS OF FLUORIDATED WATER AND FOOD PREPARED WITH FLUORIDATED WATER UNDER THE FEDERAL FOOD, DRUG, AND COSMETIC ACT. (a) The program for fluoridation of public water supplies recommended by the Federal Security Agency, through the Public Health Service, contemplates the controlled addition of fluorine at a level optimum for the prevention of dental caries.

"(b) Public water supplies do not ordinarily come under the provisions of the Federal Food, Drug, and Cosmetic Act. Nevertheless, a substantial number of inquiries have been received concerning the status of such water under the provisions of the Act and the status, in interstate commerce, of commercially prepared foods in which fluoridated water has been used.

"(c) The Federal Security Agency will regard water supplies containing fluorine, within the limitations recommended by the Public Health Service, as not actionable under the Federal Food, Drug, and Cosmetic Act. Similarly, commercially prepared foods within the jurisdiction of the Act, in which a fluoridated water supply has been used in the processing operation, will not be regarded as actionable under the Federal law because of the fluorine content of the water so used, unless the process involves a significant concentration of fluorine from the water. In the latter instance the facts with respect to the particular case will be controlling."

Work on Nutritional Anthropometry

Dr. Josef Brožek, Secretary of the Committee on Nutritional Anthropometry of the Food and Nutrition Board, reported at the Board's April 24 meeting evidence of interest from a wide variety of workers in this country and abroad in response to letters sent out by Dr. Ancel Keys, Chairman of the Committee. These letters outlined, first, the general problem of anthropometric measurements and standards in nutrition evaluation, and second, a tentative proposal for such measurements. The Committee will revise its tentative proposals in the light of the suggestions and recommendations received.

Committee members have been working on standardization of methods. The Committee is satisfied that skin folds, measured in the proper places and with the proper instruments, provide the most useful index of leanness-fatness. The Laboratory of Physiological Hygiene of the University of Minnesota has developed an instrument for this purpose, with the hope of obtaining international approval and consequent international use. The instrument should be available within a few months.

The Committee has plans for preparation of a monograph covering the anthropometric evaluation of nutrition, presenting the basic principles and such standards as are available. The areas requiring further research will be emphasized and the merits and limitations of the different approaches will receive careful scrutiny. A comprehensive bibliography will be included.—*From Proc. Food and Nutrition Board 12: 12 (May), 1952.*

The Vital Story of Bread Enrichment

by Science Writer

1951 marked the Tenth Anniversary of the white bread and flour enrichment program in the United States. This ten-year experience proved the success of a program which used the combined talents of bakers and millers, nutritionists and physicians, diet experts and chemists . . . an inspiring example of how a good food is made better in the American way of free initiative and cooperating effort. In fact, the value of enrichment is so highly regarded that over one-half of our states and several territories have already passed laws making its use mandatory in all white bread and family white flour sold commercially in those areas. The Council on Food and Nutrition of the American Medical Association is on record as supporting enrichment as is the Food and Nutrition Board of the National Research Council.

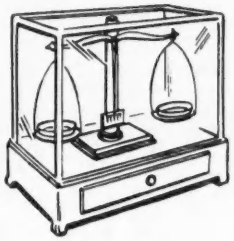
> "It is encouraging and gratifying to compare the health of the American people today with what it was 10 years ago," said Elmer L. Henderson, M.D., President of the American Medical Association.
>
> "And I do not think it is too much to say that a very important part of the more buoyant health and the increased mental and physical vigor the American people enjoy today can be directly credited to the enrichment of bread with essential vitamins and minerals."

The skeptics, "food faddists," and others who demanded proof that enrichment benefited the public health were again answered emphatically when the dramatic results of a long term nutritibnal study in Newfoundland were made public.

What is enrichment? Before answering that question, let's note two indisputable facts.

Fact No. 1—Americans generally want beautifully fine, white bread.

Fact No. 2—In milling and processing wheat to get this white flour which the public demands, some nutritional values are unavoidably lost.



Enrichment is the process which restores the following vital vitamin and mineral values to the finished white bread or milled white flour: thiamine, riboflavin, niacin, and iron. Calcium and vitamin D may also be added as optional ingredients.

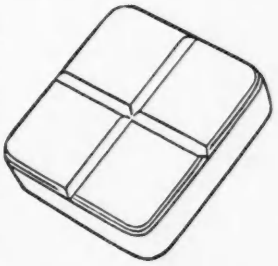
Many vitamins have been isolated in the laboratory so that the pure substance could be studied. Brilliant chemists have "built" duplicates of them by complex processes. They are identical chemically and biologically with those existing naturally. A vitamin is a vitamin regardless of its source, just as salt is salt whether it comes from a mine or is evaporated from the sea. Large-scale manufacturing efficiency permits vitamins to be sold at a lower cost than if they were extracted from natural sources.

These are the vitamin and mineral factors which are used in white bread and flour enrichment:

> **Thiamine**—also called vitamin B_1. This vitamin helps to build physical and mental health. It is essential for normal appetite, intestinal activity and sound nerves.
>
> **Riboflavin**—also called vitamin B_2. This vitamin helps to keep body tissues healthy and to maintain proper function of the eyes. It is essential for growth.
>
> **Niacin**—another "B" vitamin, is needed for healthy body tissues. Its use in the American diet has done much to make a serious disease called pellagra disappear.
>
> **Iron**—is the mineral used in enrichment. It is essential for making good, red blood and preventing nutritional anemia.

It is possible to enrich bread by two basic methods. One involves the use of flour which is enriched at the mill in accordance with the Federal Definitions and Standards of Identity. The other method, which is widely used by bakers, merely requires the addition of a small wafer.

The Hoffmann-La Roche people manufacture vitamins literally by the tons. To do this they must use amazingly complex processes with scientific production controls and the latest equipment, which can fill a building a city block square and many stories high. Roche combines the enriching ingredients in a form known as the Square wafer. It is distributed by leading yeast company salesmen throughout the United States.



The Square wafer for bread enrichment measures 1¼ inches across. It is ¼ of an inch thick. Yet it contains enough thiamine, riboflavin, niacin and iron to enrich 100 pounds of flour so that the resulting product will meet the requirements of all State enrichment laws with an ample safety margin. The formula is as recommended by the Scientific Advisory Committee of the American Institute of Baking.

Here is a suggested statement for white bread labels or wrappers which has the approval of the A.B.A. and the A.I.B.:

> 8 ounces of this enriched bread supplies you with at least the following amounts of your minimum daily requirements for these essential food substances: Thiamine (Vitamin B_1) 55%; Riboflavin (Vitamin B_2) 17.5%; Niacin (another "B" Vitamin) 5 milligrams; Iron 40%.

This information is published by the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. Reprints of this entire article as presented to the baking industry are available on request.

(Advertisement)

Book Reviews

Reducing Cookbook and Diet Guide. By Llewellyn Miller. New York: Thomas Y. Crowell Company, 1952. Cloth. Pp. 262. Price $2.75.

This is a book for the gourmet. Since many of the obese are interested in the unusual in recipes or seasonings, it should find a ready market.

Recipes include many unusual combinations of vegetables with meat and fish, with emphasis on the use of herbs and condiments to increase the appeal of a limited menu. There are a number of interesting recipes for sauces and dressings for vegetables and salads and a few low-calorie desserts using milk, eggs, gelatin, and fruits.

Defatted dry milk solids are presented in unusual recipes as are the various types of cultured milks. Most of the recipes require a relatively long list of ingredients and ample time for compounding.

The principles of reducing are presented accurately and interestingly. The dietary suggested is adequate in nutrients, but the pattern of foods suggested is the familiar one of low-fat, moderate-protein intake with fruits and vegetables supplying the bulk of the carbohydrate calories. In spite of the advice that you may "eat all you want" as long as you limit your selection to the list of foods allowed, the diet depends principally on vegetable bulk for satiety. The number of completely prohibited foods is long, and one might question the exclusion of starchy vegetables, small servings of which are satisfying and do not provide excessive calories. However, whether he follows the dietary prescription outlined or one prescribed by his doctor, the reducer will find many ideas in this book to make food taste better.—*Margaret A. Ohlson, Ph.D., Head, Department of Foods and Nutrition, Michigan State College, East Lansing.*

Food Science. A Symposium on Quality and Preservation of Foods. Edited by E. C. Bate-Smith and T. N. Morris. New York: Cambridge University Press, 1952. Cloth. Pp. 319. Price $8.

This book is a collection of lectures given at the University of Cambridge by some twenty-six contributors. The authors in each section are authorities in their fields. The subjects discussed include the technical aspects and composition of the principal foodstuffs, physical and chemical basis of quality in foods, microorganisms and the principles of control of microbial spoilage, chemical mechanisms of spoilage, and principles of food preservation. There are numerous graphs and tables and twenty-six plates including several electron micrographs of plant and muscle tissue. The presentation of subject matter is direct and factual, and sources of experimental data are given at the end of each section.

In the introduction it is pointed out that today we are dependent on machinery for the planting, harvesting, storage, transport, processing, and distributing of food to the consumer. The industrialization of food production demands new knowledge about the behavior and properties of foodstuffs. "Food Science is no mere technology, but rather a subject of primary importance for the future of humanity, demanding work of the most fundamental kind over a wide range of 'sciences.' Not only may Food Science profoundly affect the future of mankind, as dealing with one of man's primary needs, but it may also prove to be one of the great unifying activities."

This should be a useful reference for all dietitians and a text for the food specialists.—*E. Neige Todhunter, Ph.D., Head, Department of Foods and Nutrition, University of Alabama, Tuscaloosa.*

The Clinical Use of Fluid and Electrolyte. By John B. Bland, M.D. Philadelphia: W. B. Saunders Company, 1952. Paper. Pp. 259. Price $6.50.

The author's chief aim was to provide a practical, usable guide for the clinician that would aid in the recognition and treatment of abnormal fluid and electrolyte patterns in the medical and surgical patient. Recent research information, including some of the author's initial investigations on electrolyte metabolism and fluid balance, is interpreted.

The first section of the book deals with the basic physiology of body fluids and their electrolytes, and contains many diagrammatic illustrations describing the compartments of body fluids and their inorganic components. Respiratory and renal regulation of body fluids is also considered.

One chapter discusses the role of potassium in the body and the factors which cause deviations from normal. A table of the sodium and potassium content of foods is also included. Abnormalities of electrolytes and fluids, as observed in pediatric, geriatric, medical, and surgical patients, and their treatment are covered.

The author makes frequent reference in various chapters to the importance and rationale of the diet and some of the nutritional problems encountered with various diseases.

This book should serve as an excellent reference to the dietitian interested in this field.—*Ann Reimer, Head Therapeutic Dietitian, University Hospitals, Iowa City, Iowa.*

Handbook for Group Leaders. By Ann Curphey Brown and Sally Brown Geis. New York: Woman's Press, 1952. Cloth. Pp. 212. Price $3.

The title of this book is somewhat misleading, since the term "group leaders" has acquired a certain connotation within professional circles in recent years which the authors have ignored.

The book is written primarily for officers of clubs and organizations and is concerned with committee work and program planning. Certain sections might be of interest to new officers of state and local dietetic associations. The sections on Committees, Leadership, Details that Count Toward a Good Meeting, and the Use of the Newspaper, Radio and Television provide suggestions for those carrying leadership responsibilities in any organization.

However, the book should not be considered to cover the new techniques of group work, such as the 6–6 buzz sessions, group discussion, group decision, role-playing, workshops, and similar methods of procedure which are being used with increasing frequency in employee training situations, community nutrition work, and education.—*Helen E. Walsh, Chief, Nutrition Service, California Department of Public Health, San Francisco.*

Townsman's Food. By Magnus Pyke, Ph.D., F.R.I.C. London: Turnstile Press Ltd., 1952. Cloth. Pp. 212. Price 15s. net.

Although this book is written by an Englishman, one-time Principal Scientific Officer (Nutrition), Ministry of Food, and no doubt is written more especially for people

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in the United Kingdom, we in America will find it worth while to read. In fact, many references are made to the United States. It is one of the more fascinating books on modern food technology. *Townsman's Food* will be as interesting to the inquiring layman as it is for nutritionist, food producer, and scientist.

In the preface, the author states that he has tried to look at the busy world of modern food technology as a whole, not so much to provide the general reader with the details of processes and factory methods but rather to attempt to show what has happened to "civilised" food. As he sees it there are two kinds of food scientists. One of the scientists is a nutritionist who calculates the adequacy of a diet in terms of food nutrients and points out the relative values of foods in terms of money spent. The second kind of food scientist is not primarily concerned with food values but rather the study of the chemistry of the foods he handles, the best methods of preserving, transporting, packing, storing, coloring, and flavoring them. These two kinds of scientists must work together and appreciate each other's contributions.

In order to describe for "an intelligent, non-scientific reader" some of the technical problems of modern food industry and to examine the aims and purposes of its techniques and policy, the author takes all kinds of food in turn and in a lively manner tells what they consist of, how they are processed, and ponders the social implications and psychologic reactions of the foods. Each commodity presents its own problem in technology. The three fold purpose of food technology is first to make it possible to assemble the great quantities of food required by a crowded population; second, to make food as agreeable as may be to eat; and third, to maintain or improve its nutritional value and hence the health of the consumers.

A few quoted statements from several of the chapters will illustrate the popular presentation of this subject which is usually presented in a more academic fashion.

"Another example of the powerful attraction of colour—again browness—is provided by the dyeing of kippers . . .The artificial coloring of foods to improve their attractiveness is as defensible ethically as the artificial colouring of ladies' faces. In both instances the 'necessity' for technical enhancement is to be deplored; but, if the necessity exists, an all-round increase in happiness is gained by the use of harmless deception."

"The example of meat shows very clearly the two different premises upon which quality can be assessed in food. On the one hand there is quality in the sense of a mild flavour whose acceptability is dependent on the fashion and locality of the people judging it . . . On the other hand the nutritional scientists and dieticians apply a completely different set of criteria in judging meat as food.

"Corned beef, from which the nutrients in meat extract have been removed, contains in consequence less riboflavin and nicotinic acid than fresh meat. This is a matter of consequence when, as at the siege of Tobruk, corned beef forms a major component of a restricted diet."

"The fish available in a modern industrial country today is not a particularly striking testimony to the technical and scientific skills which have been applied to its acquisition and treatment . . . The fish-and-chip industry is a British peculiarity which might almost be said to have been created to consume the poor quality fish caught by the modern fishing industry."

"But what the urban dweller expects to eat is compounded of two elements—(a) what he needs, positively and negatively, for nutritional well-being and (b) what a variety of influences—education, taste, custom and availability—lead him to choose.

"The standards voluntarily maintained by manufacturers and those imposed by public health authorities alike are, each in their degree, influenced by the conscience of the period in which they are set up. The behaviour of both the public authority and the manufacturer can be swayed by expediency."

In the concluding chapter, Dr. Pyke reminds us again that people have strong emotional feelings about food. It is useful to remember that a good healthy diet can be constructed from many combinations of food. Reference is made to the influence of public education in nutrition. The quality of food is determined in part by the manufacturer and in part by the public authorities who set standards of purity and nutritional value, but the most important factor is the influence of the consumer. The food technologist makes supplies available, but how "good" the present diet is depends on the consumer's choice of those supplies and on how he combines, cooks, and serves what he buys.—*A. June Bricker, Director, Home Economics Bureau, Metropolitan Life Insurance Company, New York.*

RECENT BOOKS RECEIVED

Iodine Pharmaceuticals—A Checklist of Iodine Compounds and Preparations. London: Chilean Iodine Educational Bureau, 1952. Paper. Pp. 78.

It's Easy to Be a Good Cook. By Jessie De Both. Garden City, New York: Garden City Books, 1952. Cloth. Pp. 254. Price $2.50.

Living Agents of Disease. By James T. Culbertson and M. Cordelia Cowan. New York: G. P. Putnam's Sons, 1952. Cloth. Pp. 624. Price $5.50.

Blakiston's Illustrated Pocket Medical Dictionary. Edited by Normand L. Hoerr, Ph.D., M.D., and others. Philadelphia: The Blakiston Company, 1952. Washable cover. Pp. 1032. Price—plain, $3.25, thumb-indexed $3.75.

Vegetable Cookery. By Florence LaGanke Harris. New York: A. A. Wyn, 1952. Cloth. Pp. 268. Price $3.

The Treatment of Acute Dehydration in Infants. By a working team appointed and advised by the Committee on Acute Infections in Infancy. Medical Research Council Memorandum No. 26. London: Her Majesty's Stationery Office, 1952. Paper. Pp. 50. Price 3s. net.

Sanitary Food Service. Public Health Service Publication No. 90. Washington: Government Printing Office, 1952. Paper, spiral bound. Pp. 209 + vi. Price $1.50.

Hospital Organisation and Management. 4th ed. By Capt. J. E. Stone. London: Faber and Faber, Ltd., 1952. Cloth. Pp. 1722. Price 8 guineas, net.

Iodine Content of Foods—Annotated Bibliography, 1825–1951. London: Chilean Iodine Educational Bureau, 1952. Cloth. Pp. 183. Price 21s. net.

Biochemical Preparations. Vol. 2. Eric G. Ball, Editor-in-Chief. New York: John Wiley & Sons, Inc., 1952. Cloth. Pp. 109. Price $3.

Home Freezers Aid Convenience, Not Economy

Home freezers effected little or no saving in food bills, according to Tucson, Arizona, freezer owners who cooperated in a recent study by the Production and Marketing Administration, U.S.D.A., and the University of Arizona. The freezer owners, purchasing frozen meats and commercially frozen fruits and vegetables in quantity, reduced by about 12 per cent the time required for shopping and preparation of food for cooking. The advantage of the freezers was found to be convenience rather than economy.

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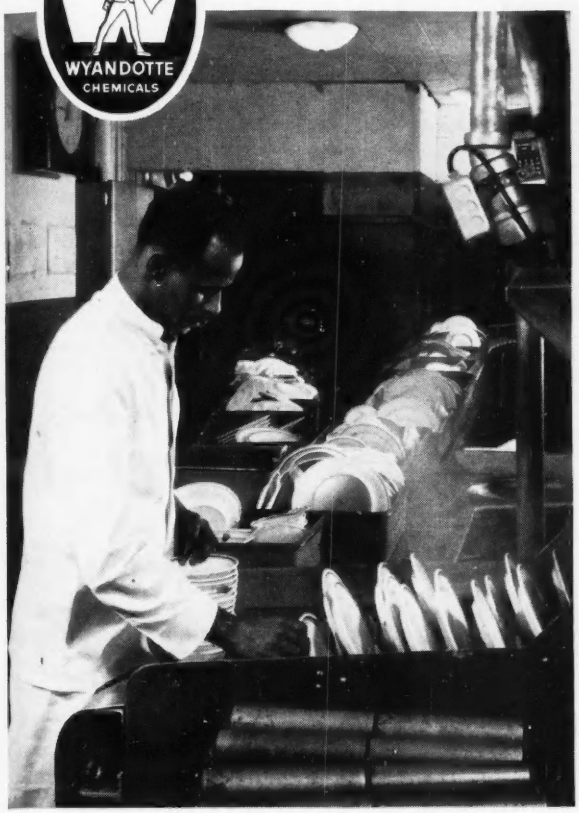

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Current Literature

Contributed by Mildred Bonnell and administrative dietetic interns, University of Washington, Seattle; Janette C. Carlsen and Ethel M. Miller, The Johns Hopkins Hospital, Baltimore; Pauline Kegereis, The Children's Mercy Hospital, Kansas City, Missouri; Elizabeth H. Tuft, Wesley Memorial Hospital, Chicago; and the Journal staff

THE AMERICAN JOURNAL OF MEDICINE

Vol. 12, June, 1952

* Forced high caloric, low protein diet and the treatment of uremia. W. J. Kolff.—p. 667.

Forced High-Calorie, Low-Protein Diet in Uremia. Many of the symptoms of so-called acute uremia are due to overloading the body with salt and fluids. Water restriction and salt deprivation are essential in the treatment of anuria. Catabolism of the body proteins and urea production can be greatly reduced if the patient's caloric requirements are met with carbohydrates and fat. The patient should be persuaded or even forced to take the high caloric diet. In several of the reported cases, urea production and excretion was reduced to 2 to 5 gm. per 24 hr. The patient's serum potassium may also be lowered by this diet. Severe intoxication, infections, crushing injuries, or necrosis may, however, cause a rapid rise in blood urea and potassium. In those patients first seen after severe uremia and overhydration had already developed, dialysis with the artificial kidney or peritoneal dialysis improved their condition so that they were able to take the high caloric diet. Some suggestions for the diet are presented. It is the author's impression that patients with chronic, severely impaired kidney function may live longer and more comfortably when using this diet.

ANALYTICAL CHEMISTRY

Vol. 24, July, 1952

* Chemical method for determining vitamin B_{12}. G. O. Rudkin, Jr., and R. J. Taylor.—p. 1155.

Chemical Method for Vitamin B_{12}. A new chemical method for determining vitamin B_{12} has been devised to replace the costlier and less accurate biologic assay. The chemical assay approaches the biologic method in sensitivity and excels it in speed and accuracy. The details of the assay are described, and it is noted that the method was applied to solutions of vitamin B_{12} varying in purity from broth to the pure vitamin.

ANNALS OF INTERNAL MEDICINE

Vol. 36, May, 1952

Prolonged renal salt wastage in "lower nephron nephrosis." R. E. Hunter and E. E. Muirhead. —p. 1297.

Vol. 36, June, 1952

* The use of amphetamine combinations for appetite suppression. S. C. Freed and M. Mizel.—p. 1492.

Amphetamines for Appetite Suppression. The authors believe that amphetamines are of considerable value in the treatment of obesity during the period of reeducation. There is considerable variation in the reactions of patients to the dextro and the racemic forms.

ARCHIVES OF INTERNAL MEDICINE

Vol. 89, June, 1952

* Modern concepts of acid-base regulation. R. F. Pitts.—p. 864.

Vol. 90, July, 1952

* Results of cortisone-corticotropin therapy in chronic active rheumatic fever. D. Young and M. Rodstein.—p. 64.

Acid-Base Regulation. The kidney participates in regulating body neutrality by stabilizing the plasma concentration of bicarbonate at a level of 25 to 27 mEq per liter. This stabilization is effected by the salvage of the filtered bicarbonate and the restoration to the body of the base utilized in neutralizing metabolic acids. Quantitatively the salvage of bicarbonate from the glomerular filtrate is the more significant, because each day more than a pound of the sodium salt is absorbed by the renal tubules. The efficiency of the absorptive mechanism is such that under normal conditions less than 0.1 per cent of the filtered bicarbonate is wasted in the urine. Nevertheless, after the ingestion of bicarbonate, large quantities can be eliminated in the urine with only a slight increase in plasma level. The mechanisms which substitute hydrogen and ammonium ions for sodium ions in the tubular urine are no less important in maintaining the acid-base balance than are those for absorption of bicarbonate. The acidosis of diabetes is due to the flooding of the body with such a load of metabolic acid that the kidneys are unable to substitute ammonia and hydrogen ions rapidly enough to prevent depletion of base. The acidosis of chronic nephritis results, at least in part, from the inability of the damaged tubules to effect these exchanges with sufficient rapidity.

Cortisone-Corticotropin Therapy in Rheumatic Fever. In reviewing thirty-nine cases of chronic, active rheumatic fever, the authors concluded that one cannot anticipate that use of adrenocortical therapy will produce a total disappearance of the active process. Definite benefit can be achieved, however, in the alleviation of congestive heart failure. Intensification of the severity of the cardiac symptoms in the early period of therapy is frequent, but is no contraindication to continuance of the treatment if a sodium-restricted diet is maintained and adequate use is made of the mercurial diuretics. There was no regression in heart size and rarely in the cardiac murmurs. Most of the children felt better shortly after initiation of treatment and the appetite improved. Fever was not consistently affected.

BRITISH MEDICAL JOURNAL

No. 4771, June 14, 1952

* Cholesterol tolerance in coronary thrombosis. I. Wang.—p. 1278.

No. 4775, July 12, 1952

* Conversion of folic acid to the citrovorum factor in health and pernicious anaemia. G. H. Spray and L. J. Witts.—p. 62.

Cholesterol in Coronary Thrombosis. This investigation was planned to determine whether dietary cholesterol bears any relation to coronary thrombosis, and in particular, to learn if patients suffering from coronary thrombosis showed intolerance to cholesterol. The results showed that there was no abnormal post-absorptive increase in blood cholesterol. Atheroma did not seem to depend on the cholesterol content of the diet, and the treatment of coronary thrombosis by a low-cholesterol diet is unlikely to be of benefit. The results of this test suggested that there might be intolerance of ingested cholesterol in patients with nephritis, diabetes mellitus, and myxoedema.

Folic Acid and the Citrovorum Factor. There is reason to believe that in the body folic acid is converted to folinic acid or citrovorum factor; yet it seems unlikely that pernicious anemia is due to a failure to make this conversion. A study has been made on the excretion of folinic acid in the urine in healthy people and patients with pernicious anemia. Eleven normal people, eight with pernicious anemia in relapse, and five of the same group of patients after treatment were studied. Untreated patients with pernicious anemia excreted significantly less folic acid after the test dose than either normal subjects or patients with treated pernicious anemia. The results indicate there may be a deficiency in the conversion of folic acid to folinic factor in pernicious anemia relapse, but there is also an increased avidity of the tissues for citrovorum factor.

DIABETES

Vol. 1, July-August, 1952

* Effects of acidosis on insulin action and on carbohydrate and mineral metabolism. G. M. Guest, B. Mackler, and H. C. Knowles.—p. 276.

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* A survey of tuberculosis among diabetics. E. S. Dillon, K. R. Boucot, D. A. Cooper, P. Meier, and R. Richardson. —p. 283.

Acidosis and Diabetes. Acidosis *per se*, in lowering the *p*H and alkaline reserve of body fluids, is shown to have far-reaching effects in a long series of metabolic derangements in the course of diabetic coma. Discussed here are inhibition of insulin action, decreased glucose tolerance, inhibition of the uptake of glucose from the blood by extrahepatic tissues, inhibition of blood glycolysis, development of mild hyperglycemia, hemoconcentration, and losses of intracellular labile phosphates and potassium.

Tuberculosis among Diabetics. There has been a general impression that diabetic patients have an increased susceptibility to tuberculosis. In a study of the situation conducted in Philadelphia, active tuberculosis was found in 8.4 per cent of observed diabetics as compared to 4.3 per cent of a control group of industrial workers. As in other groupings, the presence of tuberculosis was found to be greater in underweight than in overweight persons and in those under forty years of age. Tuberculosis was found more likely to be active in diabetic patients and the prevalence of active tuberculosis increased with the severity of the diabetes.

INDUSTRIAL AND ENGINEERING CHEMISTRY

Vol. 44, August, 1952

* Preparation of cation exchange resins of high physical stability. R. M. Wheaton and D. F. Harrington.—p. 1796.
* Industrial wastes. H. R. Murdock.—p. 99A.

Industrial Wastes. Dilute waste waters from the milk processing industry can be treated to produce a high-protein sludge containing vitamin B_{12}. Either a partial or a complete treatment process can be used, but the partial process is possibly the most economical and flexible in application.

Cation-Exchange Resins. Some techniques used in the manufacture of one type of cation-exchange resin which have resulted in increased physical stability are described. The purpose was to make the product (known as Nalcite HCR) as uniformly spherical and as free from internal flaws as possible.

INDUSTRIAL MEDICINE AND SURGERY

Vol. 21, June, 1952

Psychosomatic principles of nutritional therapy. H. T. Kelly.—p. 266.

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Vol. 149, July 19, 1952

* Loss of sense of taste due to methylthiouracil therapy. N. G. Schneeberg.—p. 1091.
* Low hemoglobin levels in women as revealed by blood donor records. G. W. Hervey, R. T. McIntire, and V. Watson.—p. 1127.
* Metabolism of fructose in the diabetic. Editorials and Comments.—p. 1142.
* Nutrition and the older adult. Editorials and Comments.—p. 1143.

Vol. 149, August 2, 1952

* Recent advances in the medical treatment of cirrhosis of the liver. S. A. Portis and S. Weinberg.—p. 1265.
* Nutritional implications of sodium restriction. Council on Foods and Nutrition.—p. 1317.

Loss of Sense of Taste. Reports are given of two cases in which therapy by methylthiouracil caused complete loss of the sense of taste, and in one, partial loss of the olfactory sense also. Such a response to the drug is apparently benign and unaccompanied by other effects; therefore, treatment needs to be stopped only when the patient can no longer tolerate food and drink because of its insipidity. With the cessation of treatment in the cases reported, full sensation eventually returned.

Anemia in Blood Donors. A review of data collected from American Red Cross blood procurement records shows that fewer women are blood donors than men and that, of those who volunteer, 12.6 per cent are disqualified because of low hemoglobin levels as compared with 0.8 per cent of the men.

Fructose Metabolism. A series of studies of the changes in blood concentrations of fructose, pyruvate, and inorganic phosphate, following intravenous administration of fructose, indicate that the metabolism of fructose is different from that of glucose in both normal subjects and in diabetic subjects without insulin. It appears that a diabetic subject without insulin can metabolize the fructose in a manner similar to that of a normal person, and that the phosphorylation of fructose seems to proceed at its normal rate in the diabetic without insulin.

Nutrition for the Aging. Considerable attention is being paid to nutrition in older adults who are characterized, not by age in years alone, but rather by a decline in physical vigor and activity. It is generally agreed that principles of diet for this group are not essentially different from those of other age groups, although with decreased need for energy, daily caloric requirements are often surprisingly low. The reduction of dietary fat seems also to be a prudent measure because of the relationship of fat to serum cholesterol which in turn appears to be related to atherosclerosis. Education should play an important role in protecting older persons from food fadists, and nutritional studies for this group may well continue to be made.

Treatment of Cirrhosis. Dietary regulation is an essential part of therapy in liver disease. In this comprehensive discussion of medical treatment of cirrhosis of the liver, the authors point out that although administration of the B-complex has become almost routine, care should be taken to avoid imbalance of the elements of the complex. This appears to be necessary because definite evidence of vitamin B deficiency, *per se*, in cirrhosis has not been demonstrated. Administration of ascorbic acid protects against some hepatotoxins, and vitamins A and D, both of which are deficient in the disease, are of definite value in therapy. Inadequate absorption of vitamin K is responsible for much of the hemorrhagic tendency common in liver disease; therefore, administration of this vitamin to all patients with liver disease or jaundice is indicated. Dietary deletion of salt, often a necessary measure, must be individualized for each patient. In the long-term management of chronic cases, a highly nutritious diet containing at least 3500 calories is most important. Protein elements should amount to 1.5 to 2 gm. per kilogram of body weight per day, since protein is the most effective dietary agent in protecting the liver from damage and in promoting its repair. The carbohydrate fraction of the diet should also be as high as possible to extend caloric content and exert a protein-sparing influence. Contrary to previous beliefs, recent studies indicate that, when adequate protein is provided, a 3500-calorie diet may contain up to 175 gm. fat and still be effective in cases of decompensated liver cirrhosis. Fat is necessary for making the diet palatable enough to insure caloric intake. In general, fats of vegetable or dairy origin are tolerated better than those from meat sources.

Nutrition and Sodium Restriction. The physician prescribing a low-sodium diet must weigh carefully the therapeutic benefits expected against the consequences of a possible reduction in the intake of essential nutrients such as animal proteins of high biologic value and of the concomitant vitamins of the B complex. Thus, a reduction in animal protein and the nutrients usually associated with it may necessitate the substitution of certain other foods specifically prepared to remove naturally occurring sodium. It is desirable that processed foods be marked to indicate the reduction of other nutrients in addition to the removal of natural sodium.

THE JOURNAL OF BIOLOGICAL CHEMISTRY

Vol. 197, July, 1952

* Purification of a toxic substance from defatted soy bean flour. I. E. Liener and M. J. Pallansch.—p. 29.
* The effect of cortisone and adrenocorticotropic hormone on tyrosine metabolism in the scorbutic guinea pig. D. H. Basinski, J. D. Williams, H. A. Freund.—p. 433.
* Further studies on folic acid-ascorbic acid interrelationships in the rat. M. A. Schwartz and J. N. Williams, Jr.—p. 481.

Toxic Substance from Soybeans. Studies made to determine the toxicity of hemagglutinins derived from various legumes have given conflicting results, due in part, undoubtedly, to the crude preparations employed. The presence of antitryptic substances in raw legumes and demonstration of the growth-inhibiting properties of the trypsin inhibitor have added further confusion. Thus questions have been raised as to the extent to which these substances may be responsible for the poor nutritive value, or in some cases, the toxic effects of raw legumes. Experiments with defatted soybean flour are described, which support the hypothesis that the combined effects of the trypsin inhibitor and a toxic component which will agglutinate red blood cells are responsible for the failure of raw legumes to support adequate growth in animals.

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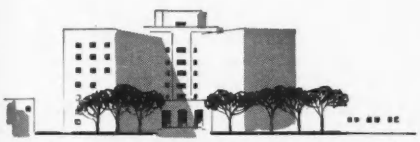

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Cortisone and Tyrosine Metabolism. A diet deficient in ascorbic acid was fed to guinea pigs that were also given extra amounts of *l*-tyrosine and dosed with cortisone, adrenal cortical extract, desoxycorticosterone acetate, and ACTH in an effort to define more closely the limits of ascorbic acid-like activity of the steroid. The appearance and disappearance of partial metabolites of tyrosine when ascorbic acid is either withheld or administered provided a technique for the study. Results indicate that cortisone, adrenal cortical extract, and desoxycorticosterone acetate did not prevent the appearance of intermediary metabolites of tyrosine in the urine of the ascorbic acid-deficient animals, and that the effect of ACTH on tyrosine metabolism seems to be only a secondary function of the hormone.

Relationship of Folic Acid and Ascorbic Acid. To elucidate the folic acid-ascorbic acid relationship uncovered in previous experiments, male rats were divided into three groups, the first being fed a basal ration, the second receiving the same ration to which aminopterin was added, and the third receiving the basal diet with a high level of folic acid included. A known effect of aminopterin is to inhibit the utilization of folic acid, and this seems to be involved, either directly or indirectly, with the rat's synthesis of ascorbic acid. The rats fed aminopterin showed a decrease in liver ascorbic acid which appeared to be the result of actual inhibition of ascorbic acid synthesis rather than loss of formed ascorbic acid by excretion.

THE JOURNAL OF CLINICAL INVESTIGATION

Vol. 31, June, 1952

* Studies of niacin requirement in man. I. Experimental pellagra in subjects on corn diets low in niacin and tryptophan. G. A. Goldsmith, H. P. Sarett, U. D. Register, and J. Gibbens.—p. 533.

* Iron metabolism. Iron stores in man as measured by phlebotomy. D. Haskins, A. R. Stevens, Jr., S. Finch, and C. A. Finch.—p. 543.

Niacin Requirement in Man. "Corn" and "wheat" diets low in niacin and tryptophan and supplemented with other B vitamins were designed to study niacin requirement in man. Seven subjects who were maintained on these diets for 40 to 135 days were examined frequently for signs of nutritional deficiency, and the urinary excretion of niacin and tryptophan metabolites was determined. The three subjects who received the "corn" diet, which contained about 4.7 mg. niacin and 190 mg. tryptophan, for more than fifty days developed clinical signs of pellagra. No clinical evidence of niacin deficiency was observed in the other subjects. All subjects remained in nitrogen balance. Although the "corn" diet was supplemented with riboflavin, the clinical signs of niacin deficiency which developed included some pellagrous lesions which have previously been attributed to concomitant riboflavin deficiency. All of the lesions healed rapidly when a supplement of niacinamide or tryptophan was given. The findings suggest that with a "corn" diet which provides about 190 mg. tryptophan, the minimal niacin requirement of man is approximately 7 mg. per day.

Iron Stores in Man. Available iron stores in man may be measured by the mobilization of tissue iron in response to repeated phlebotomies. Retarded hematopoiesis toward the end of the bleeding period is assumed to indicate near depletion of available iron. The normal adult male had iron stores of 1200 to 1500 mg., mobilized over a period of three to four months. Prolonged iron feeding prior to the phlebotomies had little effect on the size of stores in the normal individual. Once iron stores had been depleted, they were rebuilt slowly, either from a normal diet or from orally ingested supplementary iron.

JOURNAL OF THE INDIAN MEDICAL ASSOCIATION

Vol. 21, June, 1952

* Some observations on cirrhosis of the liver. N. J. Modi.—p. 379.

Nutrition and Cirrhosis. A significant relationship between nutritional deficiency and cirrhosis of the liver has been shown, diet appearing to be an important factor in the causation of the disease. Dietary treatment consists of a high-protein, nutritious diet, supplemented with B vitamins. A study conducted in India of thirty-seven patients with the disease is reported. All had subsisted on food poor in quantity and quality that was particularly low in protein and protective components. Treated with a therapeutic diet of 150 to 170 gm. protein, 400 gm. carbohydrates, and 70 gm. fat, 43 per cent were clinically cured, 27 per cent showed fair improvement, 19 per cent died, and the remainder showed no response.

THE JOURNAL OF PEDIATRICS

Vol. 40, June, 1952

* Further studies of the use of meat in the diet of infants and young children. R. M. Leverton, G. Clark, P. M. Bancroft, and E. Copeman.—p. 761.

Vol. 41, July, 1952

* A long-term follow-up study on infectious hepatitis during pregnancy. D. Y. Hsia, R. G. Taylor, and S. S. Gellis.—p. 13.

Meat for Infants and Young Children. Twenty-eight infants in their own homes and sixty infants and twenty-eight "toddlers" in a child-care institution were subjects for a study of the effect of the addition of meat to the diet. Hemoglobin and red cell values of the infants who received meat increased above the controls. The toddlers were their own controls, and their blood values rose during a four-month period of meat supplementation and dropped when it was discontinued. The incidence of colds in the institution was reduced among the meat-fed infants. All infants were reported to have slept better and appeared more satisfied when they received the meat supplement. No adverse symptoms resulted from the addition of meat to the diets of children even as young as six weeks, nor did the meat interfere with milk consumption.

Infectious Hepatitis during Pregnancy. This follow-up study of eleven children born to mothers who suffered infectious hepatitis during pregnancy reveals that all babies are healthy and normal and showed no evidence of infectious hepatitis or other liver disease. The limited number of cases, however, is inadequate to prove that the virus of infectious hepatitis cannot be transmitted through the placenta. Infectious hepatitis during pregnancy results in a high incidence of prematurity, and the infants frequently have a stormy neonatal course. In most cases, however, once the infant has passed the critical early days of life, he will develop and grow satisfactorily.

THE LANCET

No. 6721, June 21, 1952

* Response of megaloblastic anaemia in Africans to oral crystalline penicillin G. H. Foy, A. Kondi, A. Hargreaves, and J. Lowry.—p. 1221.

No 6725, July 19, 1952

Feeding disorders in infants. Their interpretation. C. W. Vining.—p. 99.

Megaloblastic Anemia and Penicillin. The megaloblastic anemias which respond to intramuscular penicillin also respond to oral penicillin. The optimum dose seems to be 200,000 units daily for oral penicillin and 400,000 units daily for intramuscular injections. Penicillin probably produces its effect by changing the intestinal microflora. Large doses destroy not only the competing flora but also the synthesizing flora. It is suggested that a low-protein, high-carbohydrate diet produces a microflora inimical to the synthesis and/or utilization of hemopoietic factors. This may explain why the incidence of deficiency states related to vitamin B complex is so common in Africa, India, and the Balkans.

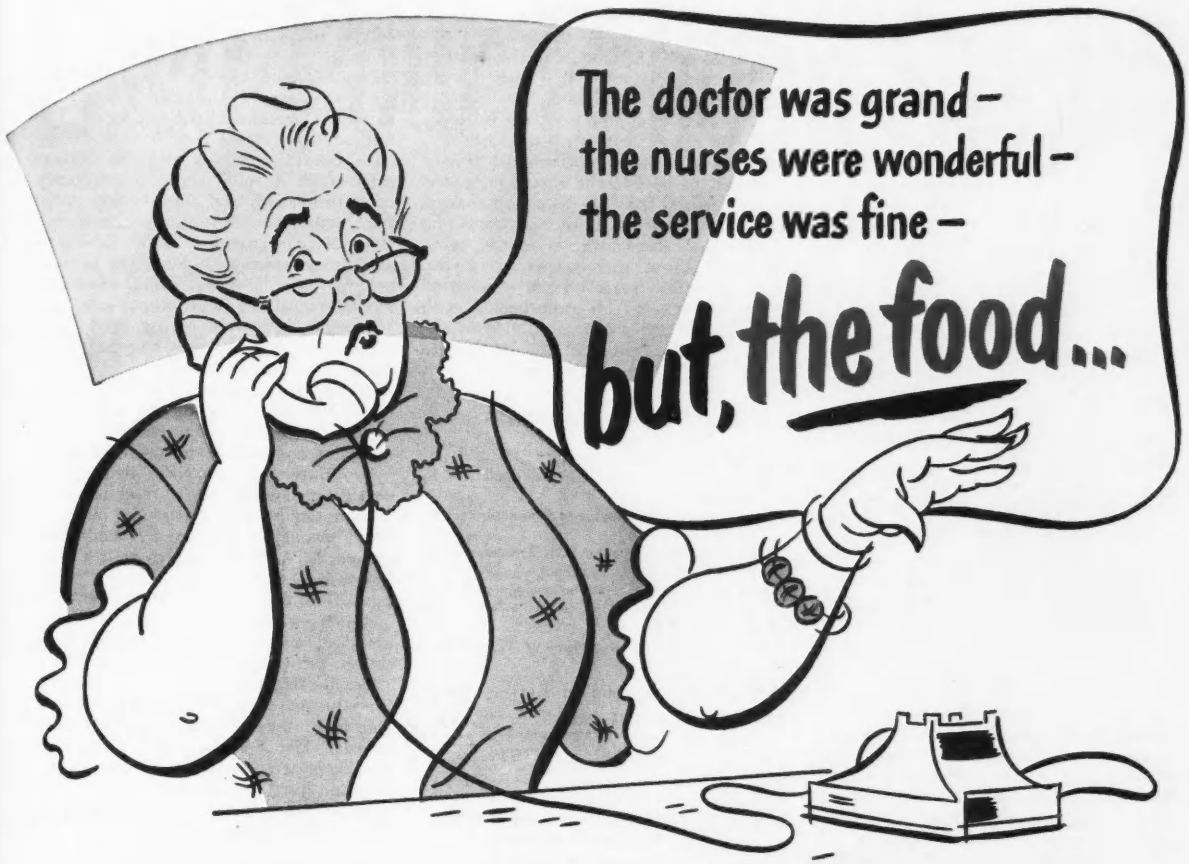
MODERN MEDICINE

Vol. 20, August 1, 1952

* Liberal diets for diabetic patients. E. H. Planck, E. A. Haunz, A. R. Colwell, J. W. Conn, H. I. Sippy, B. A. Watson, E. Tolstoi, and G. G. Duncan.—p. 90.

Liberal Diets for Diabetics. As Dr. Edward Tolstoi, of New York City, points out, diabetes has been studied so extensively that a multiplicity of therapeutic plans for its treatment have been advocated. In discussing an article by Dr. Henry J. John (April 1, 1952, in this periodical) in which liberal diets for the diabetic patient were recommended, a number of physicians support his theory fully or in part, while others, such as Colwell and Sippy, both of Chicago, are wary of liberal diet innovations that may require increased use of insulin with possible long-range deleterious effects.

Doctors Haunz and Watson endorse Dr. John's condemnation of urine examinations as sole indices of control. Both believe, however, that the intake of certain foods must be limited for the diabetic patient. Dr. Haunz explains that



• A lot of the hospital's time and money (20% to 30% of every operating dollar) is spent on food service. Yet the fact remains—the number one patient complaint in hundreds of hospitals concerns the food they are served.

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the proper ratio of carbohydrate, protein, and fat must be maintained. A constant carbohydrate allowance is believed to be necessary by Dr. Conn in order that the insulin dosage may be balanced with the diet. He agrees with the idea of a relatively liberal diet for the patient, however, as does Dr. Duncan. Control of body weight and the varying caloric needs of the individual, in diabetic as well as in nondiabetic persons, is commented upon by the latter.

The liberal dietary allowance cannot be interpreted to mean placing the diabetic person at the regular family table, says Dr. Planck, because so many families actually do not have nutritious meals. With Dr. John and Dr. Tolstoi and others, however, he is impressed with the great psychologic value of a liberal diet.

THE NEW ENGLAND JOURNAL OF MEDICINE

Vol. 246, June 19, 1952

* Vitamin A intoxication. Report of a case. G. C. Reyersbach, J. Hanelin, and R. J. Joplin.—p. 978.

Vitamin A Intoxication. With the development of vitamin concentrates, it has become possible easily to bring about vitamin A overdosage in human beings. In the reported diseases, a wide dosage range of vitamin A has been used, varying from 60,000 to 600,000 units per day. The time lapse before the onset of toxic symptoms was variable, but was usually a matter of several months. Although vitamin D was also being administered in excess in most of these cases, there was no concurrent vitamin D toxicity. The symptoms were: anorexia, irritability, pruritic skin rash, subcutaneous tender swelling, pain of the extremities, cracked dry lips, sparse coarse hair, and a high vitamin A blood-serum level.

PUBLIC HEALTH NURSING

Vol. 44, August, 1952

* Working together to meet the needs of diabetes patients. F. H. Jenne.—p. 451.
* Why British sailors are called limeys. M. Farr.—p. 456.

Cooperation in Treating Diabetes. Cincinnati's program for promoting better health and longer life for diabetic persons is discussed. The Council on Diabetes in Cincinnati was antedated by other groups in larger cities; however, its concept of the professions and the laity working together is unique. The activities of physicians, nurses, dietitians, and other professional personnel are outlined briefly, and the article mentions various diabetes - connected projects such as the lay diabetes association, the camp for diabetic children, and the recent city-wide "Diabetes Day." Literature popularized by the Council includes the Cincinnati Dietetic Association's "Food Values in Terms of Household Measures" compiled by the Association's Diet Therapy Section, and the exchange lists developed jointly by A.D.A., the American Diabetes Association, the Diabetes Branch, U. S. Public Health Service.

"Limeys." Scurvy and the history of its conquest form the basis for an entertaining story which the author, a nurse, has used among others in working with school children. Captain Cook, working on the hypothesis of James Lind, is the hero of the narrative, and it is emphasized that the discovery of fruit juices as an antiscorbutic agent was one of the first steps away from the belief that all illness was caused by germs, although the "germ" theory occurred many years later. If experiments such as Cook's had been carried further, perhaps more research on deficiencies would have taken place earlier.

PUBLIC HEALTH REPORTS

Vol. 67, July, 1952

* Nutrition lessons of the Berlin blockade. H. E. Magee.—p. 622.
* Examination and salvaging of food supplies. W. B. Rankin.—p. 627.
* Milk control planning for civil disaster. G. E. McCallum and J. D. Faulkner.—p. 635.
* Food sanitation problems in emergency feeding. G. E. McCallum, J. D. Faulkner, and S. E. Koelz.—p. 639.
* Handling of meat in an emergency. C. H. Pals.—p. 642

Nutrition Lessons in Berlin Blockade. Studies were made of the food supplied to West Berlin via the airlift during the 1948–49 blockade. The people were dependent on the airlift for virtually all their necessities. Certain practices were followed in transporting food of maximum nutritive value in the minimum of space and weight. This experience should be useful if a similar situation were to arise in the future. Maximum use was made of dehydrated foods, except dried meat which proved to be unpopular. Fat provided as much energy as possible. Flour, plus coal for baking, was flown rather than the more economical hard biscuits and bread. The latter plan was rejected for two reasons: the risk of loss from stale bread, and the importance to morale that the Berlin bakeries be kept in operation. The Berlin diet was austere—original food rations are shown in tabular form—and although nutritional status was low during the actual blockade period, signs of undernutrition declined after the rations were increased. Observations showed that 2000 calories per day were enough to keep the population at a mere subsistence level with all muscular activity reduced to a minimum. This did not work out too badly in Berlin, because of the high percentage of women, children, and aged persons. However, with a 2300-calorie diet, main industries could operate on a moderate level, although for full employment the ration would need to be considerably higher.

Examining and Salvaging Food Supplies. This article describes the Food and Drug Administration's methods for determining whether foods are suitable for consumption after damage by blast, fire, or water, or contamination with radioactive materials. A table is presented listing possible salvage procedures for various foods. The most pressing problems which remain unsolved are: how to measure alpha contamination in the field with portable equipment and how to cope effectively with sabotage of the food supply.

Milk Control in Civil Defense. The author urges development of plans by each potential target city for: diversion of fluid milk supply, emergency milk processing and distribution facilities, public health protection, substitution of concentrated milk products, rationing, training of auxiliary personnel for key positions, and obtaining auxiliary utilities, equipment, and supplies. Rehabilitation of damaged facilities and research and development needs are also discussed.

Sanitary Emergency Feeding. Principal problems relating to safe food service under emergency conditions are: (a) using equipment and menu planning appropriate for varying degrees of emergency conditions; (b) food handlers' training and mental attitude; and (c) development of emergency sanitation standards. Although the most desirable procedure—maintaining existing food sanitation and intensification of control methods—would not be possible in a disaster, basic, well-established sanitation principles will be applicable.

Meat Handling in an Emergency. Preparation of meat—a highly perishable food—must be surrounded by safeguards. The Federal Meat Inspection Service is described as to its responsibilities and functions, and problems of meat handling in civil defense are discussed.

SCIENCE

Vol. 116, July 18, 1952

* Vitality of the aged. R. J. Meyers.—p. 67.

Vol. 116, July 25, 1952

* The effect of insulin coma on uropepsin excretion. J. S. L. Jacobs, C. E. Tempereau, and P. M. West.—p. 86.
* Biosynthesis of the C^{14}-labeled form of dextran. N. J. Scully, H. E. Stavely, J. Skok, A. R. Stanley, J. K. Dale, J. T. Craig, E. B. Hodge, W. Chorney, R. Watanabe, and R. Baldwin.—p. 87.

Life Expectancy Statistics. A pessimistic forecast made in 1929 by C. H. Forsyth, which indicated a long-term decline in the average length of human life, has been refuted by the author on the basis of new data for seven selected states up to the year 1940. Analysis of the period 1900 to 1948 for the entire country is possible, however, and the statistics published here show that the general trend has been toward a steady rise in life expectancy for both men and women throughout the entire period.

Insulin and Uropepsin Excretion. While eosinophil counts furnish a satisfactory test of adrenocortical activity as a result of the administration of insulin, a quantitative measure of certain adrenocortical functions may apparently be based upon uropepsin excretion. Findings are the result of uropepsin determinations performed upon schizophrenic psychotics in the resting state and under the influence of insulin and other physical therapies.

Biosynthesis of Labeled Dextran. Dextran, a polysaccharide made up of

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glucose units produced by bacterial fermentation of sucrose, is of current interest because of its possible use as a volume expander for plasma. This use has been tested clinically with success, but the metabolic fate of dextran in the body is inadequately known. An isotopically labeled form of dextran seemed to be required for resolving metabolic questions. Procedures for biosynthesizing C^{14}-labeled dextran at two levels of activity, one for use with animals and one for human clinical experiments, are outlined.

THE SOUTHERN MEDICAL JOURNAL

Vol. 45, June, 1952

* Prolonged vomiting as a cause of potassium deficiency. B. A. Shatz and F. J. Catanzaro.—p. 525.

Vol. 45, July, 1952

* The role of vitamin B_{12} in metabolism. B. F. Chow.—p. 604.
* The utilization of ingested iron in disease. H. D. West, A. H. Jackson, R. R. Elliott, P. F. Hahn, W. A. Patterson, and R. S. Anderson.—p. 629.

Resin control of cirrhotic ascites and edema. G. McHardy, D. C. Browns, S. Ward, and J. Bechtold.—p. 636.

Potassium Deficiency. In patients who are vomiting, potassium balance may be greatly disturbed for several reasons. First, the only source of supply (the diet) is either curtailed or eliminated. Second, considerable quantities of potassium were lost in the vomitus. Gastric secretions contain potassium in a concentration of about two to eight times that of the serum. Third, despite the decreased intake, the loss in the vomitus, and the absence of adequate body reserves of potassium, the kidney will continue to excrete significant amounts in the urine. Unlike sodium, potassium is not retained or conserved by the kidneys even in the presence of a marked potassium deficiency with low serum concentrations. Treatment of potassium deficiency consists of parenteral potassium chloride, until the patient is able to take food by mouth; then diet as tolerated, plus oral potassium, and orange juice.

Vitamin B_{12} in Metabolism. The effect of vitamin B_{12} on the weight gain of normal and chronically ill children was investigated. Oral administration to healthy children of 25 mcg. per day was followed by, at best, equivocally favorable effects. Comparison over three-month periods of the mean weight changes of forty-five chronically ill children receiving B_{12} with those of forty-seven similarly ill children who did not receive the supplement strongly suggests that the individuals in the supplemented group gained more and more rapidly, even though all of the children studied were offered the same diet *ad libitum*. The influence of still unexplored factors, such as the intestinal flora of the test animal and administration of antibiotics and sulfonamides may come to the fore in future investigations.

Ingested Iron in Disease. Four hundred and twenty-three unselected hospital patients were fed reduced iron tagged with radioactive $Fe^{55\ 59}$ and an activity assay was carried out eight days later. In cases of acute suppurative infections and bacterial pneumonias, the utilization of 15 mg. ingested reduced iron should lie between 0.0 and 0.2 per cent for a one-week period. The utilization of ingested iron was not necessarily depressed in cases of malignant neoplasm. In an unselected group of hospital admissions, the majority utilized for hemoglobin synthesis approximately 1.5 per cent of a 15-mg. oral dose of iron in a week's time. In general, the influence of disease on utilization of ingested iron did not appear remarkable except in the case of acute infections. In pregnancy the utilization values were elevated.

AMERICAN RESTAURANT MAGAZINE

Vol. 36, August, 1952

* Feature fruits and cereals for breakfast variety. L. D. Freeman.—p. 30.
* A little restaurant with a big specialty.—p. 42.
* Old-fashioned favorites for your menu. J. A. Cline.—p. 48.
* Simplified portion control of 58 best sellers. G. L. Wenzel.—p. 58.

Breakfast Fruits and Cereals. "Fruit *or* cereal," all too common to restaurants' "club" breakfast menus, should be replaced by "fruit *and* cereal" so that meals may follow the basic pattern for good nutrition. Suggestions are made for fruit-cereal combinations, as well as for other breakfast dishes to add to this basic food team.

Big Specialty. Ice cream is always the main dish at a Washington, D. C., restaurant begun by a German refugee to whom ice cream had always been a luxury. "If you give the American people something unusual, they will try it," was the theory on which he based his business. His novel menu is shown, with large and elaborate ice cream concoctions. However, this restaurateur refuses to prepare any concoction which may sicken the customer, because he sincerely believes in ice cream as a food and sees to it that all of his ice cream dishes are nutritionally balanced as well as attractive and appetizing.

Uses for Beef. Grass fed beef, much of which appears on the market in late summer and early fall, is particularly adapted to braising, stewing, and meat pies. Recipes are given for main dishes utilizing this type of beef.

Portion Control. Third of a series of twelve articles, this article analyzes four fish entrées for portion control: fried shrimp, fried oysters, fried scallops, and fish fillet.

BAKING INDUSTRY

Vol. 98, August 2, 1952

* Quality in non-fat dry milk solids. T. I. Hedrick.—p. 39.
* A treatise on pies. R. L. Lloyd.—p. 73.

Nonfat Dry Milk Solids. Laboratory testing is essential in manufacturing nonfat dry milk solids, to assure a high-quality finished product. Solids should be tested for uniformity, good baking characteristics, wholesomeness, and good keeping quality in storage. Methods of analysis are described.

Pies. Each ingredient of pie crusts and fillings is analyzed as to its function and contribution to the finished pie. Formulas for pie doughs and fillings, developed in an experimental bakery, are given.

THE BISCUIT AND CRACKER BAKER

Vol. 41, July, 1952

* Working to improve sanitary practices in the baking industry. A. T. Prosser.—p. 33.
* Promoting safety in your bakery today. J. E. Bedford.—p. 35.

Bakery Sanitation. The work of the Baking Industry Sanitation Standards Committee is explained. Old machinery and equipment are sanitation hazards; for example, a dough trough is frequently kept permanently with only the casters being changed. Much has been done to correct deficiencies of design, but much has been left undone, since no specific set of design standards has been formulated for the baking industry.

Safety for Bakery Workers. Safety will always be at a peak after an employees' training program; however, a few weeks later it is often found that carelessness sets in again. The personnel manager, therefore, develops a "what's the use" attitude toward safety education for his employees. Repetition is emphasized as the only effective means of real education in safety. Suggestions for a continuous, repetitive program are: interesting and often-changed posters and bulletin boards; personal letters commending employees with high safety records; and contests and "drawings" with worthwhile rewards.

FOOD

Processing · Packing · Marketing

Vol. 21, July, 1952

* Yogurt. Part I. J. G. Davis.—p. 249.
* Food research in Britain. Part 2.—p. 267.

Yogurt. Yogurt and other soured-milk products are discussed as to history—including references to the Bible and other literature — microorganism content, and beneficial effects on digestion. The food value of yogurt, for all practical purposes, is the same as that of the milk or culture medium used to make it. However, the therapeutic value of the lactic acid organisms is a separate matter from, and must not be confused with, the nutritive value of the food. The making of yogurt, including the cultivation of organisms, is described, as is the large-scale production process. The author emphasizes that yogurt should be tested daily for: bacteriologic purity, appearance, flavor, and

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strength of culture. Some of the causes of failure of yogurt, e.g., poor quality, cultures "petering out," weak cultures, and so forth, are briefly discussed.

Food Research in Britain. This article describes the work of the Food Investigation Laboratories in England, and specifically discusses their experiments with storage of meat, fish, and eggs. Also discussed are fat deterioration, changes in milk powder in which protein is involved, and corrosion of metals used for canning fruits.

FOOD ENGINEERING

Vol. 24, July, 1952

* We borrow progress from chemical and other fields. J. H. Nair.—p. 55.
* QM pins food "likes" and "dislikes" with advanced taste-test method. D. R. Peryam and N. F. Girardot.—p. 58.
* 4 factors that spell *uniform* processed cheese. B. M. Zakariasen.—p. 65.
* Passion fruit is projected for frozen concentrates. H. Seagrave-Smith.—p. 94.

Vol. 24, August, 1952

* Dole launches frozen concentrated pineapple juice. A. A. Smyser.—p. 72.

Sciences Aid Food Technology. This article predicts revolutionary electronic, antibiotic, and atomic processing methods. Another facet of the article deals with new nutritional concepts based on discoveries made by medical research, particularly those concerned with the interrelationship of dietary factors.

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Taste-Test Scale. "Hedonic scale method" is the name of a new taste-testing technique developed by the Quartermaster Food and Container Institute for the Armed Forces. The scale's use is described and sample results tabulated. This method is valid, if the sampling of observers is appropriate and the tests properly run, for certain purposes: (a) to detect small differences in the direct response to similar foods; (b) to detect gross differences in the direct response to foods, even when time, subjects, and test conditions are allowed to vary; and (c) in field questionnaire surveys, to reveal differences in group-preference attitudes toward foods. A fourth purpose may be included with some reservation, i.e., to make general predictions on an absolute basis about the acceptance level of any food.

Passion Fruit Concentrates. Tropical passion fruit, widely used in Hawaii for sherbets and cool drinks, appears suitable for frozen concentrate when mixed with pineapple juice. Juices were blended on a 50-50 basis at the Hawaii Agricultural Experiment Station; when reconstituted, an aromatic, sharp, savory beverage which is a palatable morning drink resulted. During concentration, the color of the juice changed from yellow to orange.

Pineapple Juice Concentrate. Hawaiian pineapple juice is the latest addition to the frozen concentrate industry. Pineapple concentration differs in several respects from orange juice processing. Two principal differences are: (a) the recovery of volatile esters and their reintroduction into the final product; and (b) the 24-hr. continuous operation, with fresh juice for processing being received only a little over 6 hr. per day. The seven-step concentrating process is described.

FOOD MANUFACTURE

Vol. 27, May 1, 1952

* Quick frozen fruits and vegetables. W. V. Smedley and E. E. Pratt.—p. 188.

Quick-Frozen Fruits and Vegetables. The history of freezing various foods (vegetables are the most recent) is traced briefly, and the authors state that the year 1935 saw the real beginning of commercially frozen foods in Great Britain. Three quick-freezing methods are discussed: (a) freezing in a blast of air—the blast tunnel system; (b) freezing by indirect contact with a refrigerant—the plate system; and (c) freezing by direct immersion in a refrigerating medium.

FOOD TECHNOLOGY

Vol. 6, July, 1952

Natural flavor retained in new frozen uncooked apple pulp. G. Johnson and D. K. Johnson.—p. 242.

* New designs and techniques for organoleptic testing. M. E. Terry, R. A. Bradley, and L. L. Davis.—p. 250.
* Radiological contamination of food. I. G. Poppoff, G. W. Morrison, and F. R. Holden.—p. 278.

Vol. 6, August, 1952

* Effect of pure salt on the oxidation of bacon in freezer storage. A. M. Gaddis.—p. 294.
* The retention of carotene during the canning of

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tomato juice. N. H. Strodtz, T. E. Blumer, and L. E. Clifcorn.—p. 299.

* Antioxidants and food preservation. R. W. Bentz, T. J. O'Grady, and S. B. Wright.—p. 302.

Use of antioxidants in the frozen storage of turkeys. A. A. Klose, E. P. Mecchi, and H. L. Hanson.—p. 308.

* The effect of fluctuating storage temperature on the quality of stored frozen foods. J. D. Winter, A. Hustrulid, I. Noble, and E. S. Ross.—p. 311.

Organoleptic Testing. A newly formulated experimental technique and analysis for paired comparisons of flavor is described. The small number of observations needed promotes efficiency, and the method is flexible enough to be adaptable to much testing of sensory differences in that the effect of judges or groups may be controlled and a test of agreement performed. Some experiments performed with this method are: testing for differences in cooked fresh pork and cured hams, and testing for the effect of monosodium glutamate in applesauce and dehydrated apples.

Radiologic Contamination of Food. Contamination problems arising from radioactive particulate matter widely dispersed by an atomic explosion are considered. Various types of radioactive contamination of food are explained. This article emphasizes that although the problem of coping with such an emergency would not be easy, neither would it be hopeless. Also stressed is the need for trained personnel to analyze the situation and determine the feasibility of salvaging foods.

Salt and Bacon Oxidation. Freezer storage of cured pork is basically a good idea, since it is one of the most perishable meats. However, cured bacon becomes rancid more rapidly in the freezer than uncured sides. Two experiments were performed to test the effect of salt on oxidation. Oxidation was found to be most rapid during the curing period. Freezer storage reduced the rate of oxidation of cured sides perceptibly, although it was still more rapid than in similar frozen fresh sides. During both the curing period and subsequent freezer storage, the rate of oxidation appeared to be directly related to the salt concentration. However, sides cured and smoked before freezer storage appeared to be nearly equal to those cured and smoked after storage.

Carotene Retention in Canned Tomato Juice. Analytical procedures were used to determine carotene retention during the canning of tomato juice. It was shown that carotene retention during this process need not be considered as low as results previously published would indicate. Carotene losses before processing were shown to be entirely the result of mechanical separation. Thermal processing caused small but measurable losses. The over-all results indicated that carotene is a relatively stable substance in ordinary canning operations.

Antioxidants and Food Preservation. Incomplete understanding of antioxidants and their use may cause failure to retard rancidity when they are used. Suggestions for proper use are given: description of the properties of the most common, i.e., butylated hydroxyanisole, propyl gallate, nordihydroguaiaretic acid, citric acid, and propylene glycol; concentration which should be used in preserving a particular food; and the various ways to apply antioxidants (solution, addition, painting and dipping, spraying, and injection and pumping).

Storage at Fluctuating Temperatures. Effects of fluctuating storage temperatures on frozen ground beef, ground pork, strawberries, and snap beans were tested. Temperatures ranged from 0° to 13°F. over a period of ten months. These effects were also compared with those caused by length of storage, wrapping material, shape of package, and storage at a constant temperature of 0°F. The greatest differences were caused by length of storage, wrapping material, and shape of package. The strawberries and green beans were slightly affected by fluctuating temperatures, but the change in quality was not significant. More weight was lost at the fluctuating temperatures.

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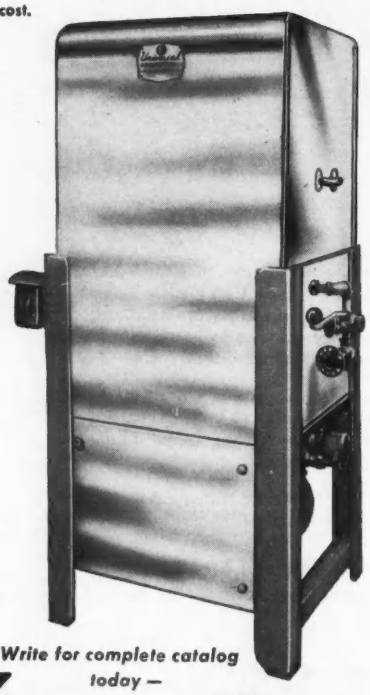

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HOSPITAL MANAGEMENT

Vol. 74, July, 1952

* Management returns through cost control. K. Hart.—p. 98.

Cites public relations value of dietitian.—p. 113.

Food Cost Control. Michigan State College has several food operations in its administrative building program, each with its own management problems.

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However, the essential requirements of food cost control are the same: (a) practicality; (b) production of useful information; and (c) saving of money over and above the expense of the food cost control system itself. The author surveys each facet of the college food service and emphasizes the fact that no simple panacea for cost control exists. Food service operators can collect ideas from industry, other operators, and case history reports—but in the end they must work out their own operations.

HOSPITALS

Vol. 26, August, 1952

* Sidestepping old problems of the small pay cafeteria. Sister M. Theophane.—p. 115.

Small Pay Cafeterias. The problems involved in converting to a paying cafeteria are essentially the same for both a large and small hospital. The problems can be solved through efficient administration, experienced personnel, and adequate planning. The purpose of instituting a pay cafeteria must be thoroughly studied before any change is made. Unless the satisfaction of the personnel and economic advantages are the fundamental reasons for the change, the problems of the dietary department multiply and disappointment results. In making this change, the hospital accepts the challenge of business competition while retaining the obligation to be considerate of employees' budgets and health.

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THE HOTEL MONTHLY

Vol. 60, August, 1952

* The appeal of color in merchandising food.—p. 44.

Color Appeal in Merchandising. Parfait pies serve as an example of the appeal of color in merchandising desserts. This helps to solve a serious problem of food operators, i.e., the difficulty of increasing the amount of checks. More and more menus are being offered on a modified table d'hôte basis, with "starters" and desserts extra. Often the guest reacts unfavorably when offered a dessert menu; thus the need for merchandising techniques. Basic recipes for parfait pies are given.

ICE CREAM REVIEW

Vol. 35, July, 1952

Specialty items do pay off.—p. 40.
* Vegetable oils in frozen desserts. E. M. Deck.—p. 45.
Yogurt sherbet—creating new customers.—p. 52.
* Analyze mix formulas to cut costs. P. S. Lucas.—p. 121.

Vegetable Oils in Frozen Desserts. Frozen desserts using vegetable oils instead of butter are to ice cream as margarine is to butter, the author states. High butterfat prices are the apparent reason for the rapid growth of this practice. However, these desserts must maintain the high standards of ice cream, including good manufacturing practices, high-quality ingredients, and equal sanitation. Types of vegetable fats and their uses are discussed, and formulas are given for frozen confections of various kinds.

Analyzing Mixes for Economy. Cost-cutting methods of making ice cream mixes, in conformity with various standards, are considered. Ice cream with a high solids content is more economical than that with a lower solids content, but care must be taken to avoid sandiness. Sugars other than sucrose may be used, and many of these produce a customer-pleasing taste. The economy of these sugars is weighed.

INSTITUTIONS MAGAZINE

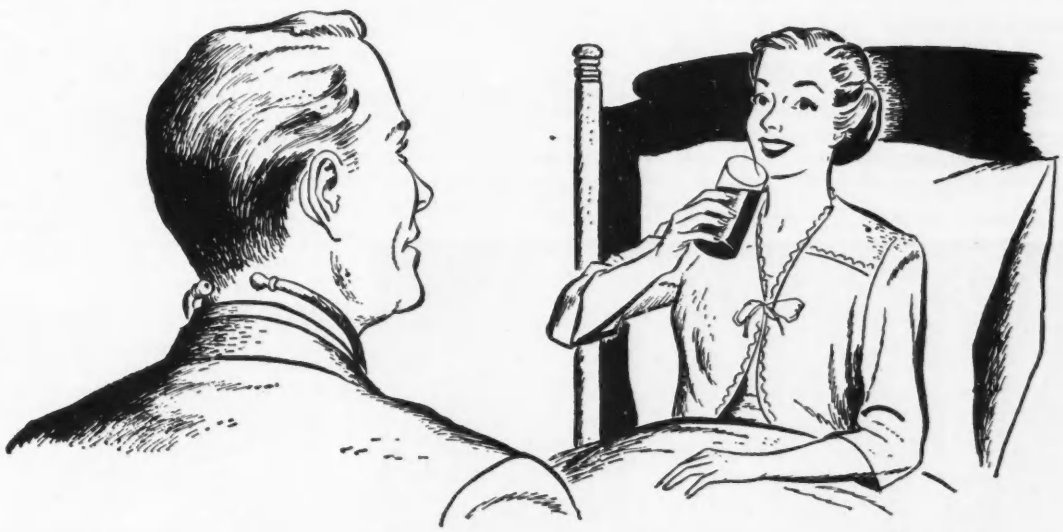
Vol. 31, August, 1952

* Earn dividends by encouraging more employee output.—p. 1.
* Patrons prefer meals served à la courtesy.—p. 1.
* How to work out sanitation plan for specific institutions. T. D. Laughlin.—p. 2.
* How to win staff approval for new sanitation program. C. H. Clark.—p. 2.
* These six steps build worker's ability to go ahead on his own. C. H. Broaded.—p. 3.
Set up high school courses to produce institutions workers. T. K. Morris.—p. 4.
* Protection of food stresses economic value of sanitation. W. H. Haskell.—p. 5.
* Structural problems overcome to provide food service area.—p. 43.
* Adjusting service to customs of community makes for success.—p. 44.
* Restore old-time atmosphere; add present-day efficiency.—p. 45.
* Small staff services operation.—p. 46.
* Cost conscious operation means better employee meals at rock bottom prices.—p. 65.
* Flexible food service.—p. 116.

Management Functions. Nine functions, it was decided at a food executives' conference, must be included in an or-

WHEN DRUG THERAPY

Increases Nutrient Requirements



The administration of many drugs can sharply increase the patient's requirements for various essential nutrients. The presence and action of certain drugs in the organism may alter normal utilization of nutrients to purposes of detoxication of these drugs. In some instances, drugs may impair absorption of nutrients, increase their destruction within the digestive tract, interfere with their metabolism, or hasten their elimination.

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COBALT	0.006 mg.	*PHOSPHORUS	940 mg.	CHOLINE	200 mg.	*THIAMINE	1.2 mg.
*COPPER	0.7 mg.	POTASSIUM	1300 mg.	FOLIC ACID	0.05 mg.	*VITAMIN A	3200 I.U.
FLUORINE	3.0 mg.	SODIUM	560 mg.	*NIACIN	6.7 mg.	VITAMIN B_{12}	0.005 mg.
*IODINE	0.7 mg.	ZINC	2.6 mg.	PANTOTHENIC ACID	3.0 mg.	*VITAMIN D	420 I.U.
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*PROTEIN (biologically complete)	32 Gm.
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*Nutrients for which daily dietary allowances are recommended by the National Research Council.

ganization's activities to realize maximum productivity. These are: planning, determining policy, setting standards and goals, reviewing personnel performance, training, motivating personnel, coordinating and organizing, counseling, and building good public and guest relations. The nine points are discussed in detail.

Meals à la Courtesy. Food service instructions have been "boiled down" to a standard sheet by an inn in Pennsylvania's Pocono Mountains. The instructions deal first with procedures before patrons arrive, then with service after guests enter the dining room, and also include advice on behavior in the kitchen.

Sanitation for Specific Institutions. "Bringing large numbers of people together usually aggravates sanitation problems," states the author. He outlines the need for broad and comprehensive sanitation programs due to the rapid growth in number and size of institutions in the U. S. The cleaning and sanitizing procedures in use today are broken down into five steps—program design, selection of materials, personnel training and "selling," carrying-out, and checking results.

Staff Approval of Sanitation Programs. Michigan State College's sanitation program is described, and the need for wholehearted cooperation of all employees is stressed. The personnel organization and training, as described, was thorough, and results have been worth while.

Developing Employee Initiative. Employee initiative is one of an institution's most valuable assets, but it must be purposely developed. The simple process is outlined: (a) clearly define job duties and responsibilities; (b) be certain the basic skills of the job are known; (c) give jobs with obvious details omitted; (d) give jobs with less obvious details omitted; (e) give only general instructions for jobs; and (f) accept and apply all worthwhile, spontaneous ideas which the employee may have.

Economic Value of Sanitation. The economic value of food sanitation is emphasized to combat the false impression that sanitation has only public health significance. The author stresses the value of educational programs.

Structural Problems Overcome. Limited space and funds were the problem of a metals company in Virginia, which converted a nearby tenement building into a food service operation. Employees, prior to that time, found it difficult to reach good restaurants within the time available to them to eat, and no luncheon facilities existed within the company. The floor plan is shown, and photographs of the cafeteria, its kitchen, and the counter show the success of the remodeling.

Service Adjusted to Community Customs. A new restaurant was recently opened in the exclusive shopping district of Pasadena, California. The service combines regular luncheons for the women shoppers with take-out pastries and candies. The restaurant's hours coincide with the shopping hours of the adjacent stores; i.e., during the pre-Christmas rush, the hours were from 10 a.m. until 11 p.m.

Old-Time Charm and Modern Efficiency. A replica of a Revolutionary War tavern in Williamsburg, Virginia, retains eighteenth-century atmosphere, although present-day techniques in sanitation, food storage, and preparation are used. Four photographs of the kitchen, accompanying the article, show no trace of 1776.

Small-Staff Service. Twenty-five hundred meals per employee per month are put out by a two-person kitchen staff and one dining-room worker at the McKinley School in Normandy, Missouri. Many labor-saving devices, including a gravity-return dish conveyor, have been incorporated in the layout.

Employee Meals. The third floor of the new Lever Brothers glass building in Manhattan is devoted to an employee cafeteria equipped to serve its 1200 employees. The article describes its kitchen, planned for convenience, and its anti-noise cafeteria plan which separates the serving area from the dining room. Congestion is avoided by careful planning.

Food Service at Sea. The S.S. *United States*, "greatest institution afloat," can prepare almost any dish a passenger may wish in its routine of serving 9000 meals a day—and its facilities can be converted to serve 14,000 troops with ease. The layout of the kitchens is shown, as well as

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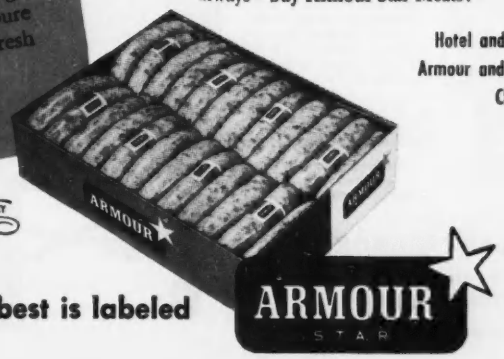

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photographs of some of the 15,700 pieces of kitchen equipment which have been installed. Officials of the steamship line, engineers, and the executive chef all cooperated in planning of the kitchen facilities and food service. Needs of special groups were also anticipated, there being a special kosher kitchen, a number of special pantries, service bars, and galleys, and a special diet kitchen which serves the ship's hospital.

THE MODERN HOSPITAL

Vol. 79, July, 1952

*Food service records tell the dietitian. N. H. Radell.—p. 112.

Vol. 79, August, 1952

* Name pins introduce staff to patients. L. Hewes.—p. 91.

* Food service in small hospitals. R. C. Lifquist and J. Hartman.—p. 112.

Food Service Records. Records and their use are an essential part of scientific food cost control. When locked in a financial office for historical information and auditors' reports, records are of little value. Those kept in the nutrition department, on the other hand, aid the dietitian who uses them in planning future operations. Various types of records are discussed in this article: menu forms, quantity recipe files, requests for price quotations, purchase orders, food requisitions, meat tags, purchase record files, perpetual and physical inventory, daily food cost reports, and special function cost sheets.

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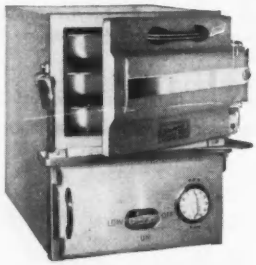

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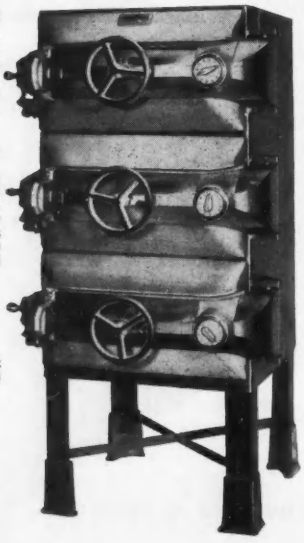

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Name Pins for Hospital Staff. Dietitians and their aides were first to wear identification pins in the Hartford (Connecticut) Hospital's plan to help patients remember the names of those caring for them. Patients expressed their approval, and now—four years later—nurses, attendants, and other personnel are cooperating in this public relations plan.

Food Service in Small Hospitals. Menu planning is the subject of this article, first of a series of four which will treat various food service problems in hospitals serving up to two hundred persons. Some of the questions answered are: Why is menu planning such a problem? What can a dietary supervisor do to make it easier? How can you select "suitable recipes"? A method for estimating the cost of a recipe is shown in tabular form, and a suggested form is presented for listing foods suitable for dinner menus. Many suggestions for appeal, economy, and unhurried service are listed.

PERSONNEL JOURNAL

Vol. 31, July-August, 1952

* Improving human relations—a checklist. E. S. Grant.—p. 92.

Human Relations Checklist. Forty-six questions on supervisor-employee relations are presented. Although they are based on conditions in industry, the dietitian in a supervisory capacity will find many of them applicable to her situation.

QUICK FROZEN FOODS

Vol. 14, July, 1952

The future of the concentrates.—p. 37.

* Hot house rhubarb.—p. 42.

* Evaluation and use of citrus juice dispensers. F. W. Wenzel, C. D. Atkins, E. C. Hill, R. L. Huggart, and R. W. Olsen.—p. 49.

Hot House Rhubarb. Quick-freezing of hot house rhubarb was begun by a Washington state frozen food plant. Only about 7 to 10 per cent of the total harvest of hot house rhubarb goes to frozen food processors; they receive only the rhubarb which is off-grade in color and size. Even so, this rhubarb makes a more satisfactory product for baking than its first-quality fresh (not frozen) hot house counterpart at approximately half the selling price. Furthermore, it has developed a market which fresh hot house rhubarb was not reaching. Many bakeries are buying one container of frozen hot house rhubarb to every two containers of frozen field rhubarb for pie-baking; the delicate flavor of the hot house product blends well with the more full-bodied flavor of the field rhubarb.

Citrus Juice Dispensers. Use of refrigerated dispensers results in increased orange juice sales, it has been reported. Two types of dispensers were tested by the Florida Citrus Experiment Station at Lake Alfred last year, i.e., those for already reconstituted concentrated juice and those which mix concentrate and water just prior to consumption. This article deals with the first type of dispenser. Tests were made for: (a) ease of cleaning and assembling; (b) efficiency

Meat...

and Its Important Contribution of Essential Amino Acids

Although the daily allowance of protein recommended for human beings has been established for some time,[1] only very recently has a recommended daily intake of individual essential amino acids been proposed.[2] These new criteria now give a more accurate means for nutritionally evaluating the protein contribution of meat than was possible just on the basis of the gross amount of protein meat provides.

The table which follows gives the proportions of the recommended daily intake of individual essential amino acids provided by six ounces of cooked meat, the approximate average per capita daily consumption in the American diet. Note that though furnishing about 52 per cent of the daily protein allowance for a normal adult male, six ounces of meat supplies more than the recommended daily intake for a majority of the essential amino acids and a goodly proportion of the recommended intake of the remainder.

Percentages of Recommended Daily Intake of Eight Essential Amino Acids and of Protein Contributed by 6 Oz. of Cooked Meat*

Essential Amino Acids	Beef[3]	Lamb[4]	Pork[4]
L-Isoleucine	141	121	127
L-Leucine	150	120	125
L-Lysine	202	163	172
L-Methionine	42	34	40
L-Phenylalanine	70	63	70
L-Threonine	160	169	183
L-Tryptophan	90	90	100
L-Valine	136	107	113
Protein	56	49	51

*In the calculations, averages of the percentages of protein in six different cuts of each type of cooked meat were used, as were averages of the percentages of the amino acids in the protein of the respective cuts.

Every kind and cut of meat is not only an excellent source of the essential amino acids but also of the nonessential amino acids, the B group of vitamins, iron, and other essential minerals. Morever, meat is rapidly and almost completely digested, has a stimulating influence upon appetite and digestion, and gives a gratifying sense of satiety. All these nutritional and physiologic advantages of meat fully justify its prominent place in normal diets of persons of all ages and in many special diets.

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1. Recommended Dietary Allowances, National Research Council, Reprint and Circular Series, No. 129, Washington, D. C., 1948.
2. Rose, W. C.: Half-Century of Amino Acid Investigations, Chem. and Eng. News *30*:2385 (June 9) 1952.
3. Greenwood, D. A.; Kraybill, H. R., and Schweigert, B. S.: Amino Acid Composition of Fresh and Cooked Beef Cuts, J. Biol. Chem. *193*:23 (Nov.) 1951.
4. Schweigert, B. S.; Guthneck, B. T.; Kraybill, H. R., and Greenwood, D. A.: The Amino Acid Composition of Pork and Lamb Cuts, J. Biol. Chem. *180*:1077 (Oct.) 1949.

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The Civil Defense Registration campaign, to be held from November 11 through 27, is being called to the attention of members of The American Dietetic Association. Between Armistice Day and Thanksgiving, the women of America will be asked to register as an indication of their willingness to be called upon to serve in their own communities in the fields for which they are best fitted.

Participation in the Registration campaign is made easy for Association members. Simply fill out the coupon below and mail it to your local or state president. The number of dietitians registering will be included in the total volunteers reported at the end of the campaign. Send your notification today so that your state and community will be well represented.

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I wish to register and to indicate my willingness to be enrolled later by my local Civil Defense Director for taking part in community protection.

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of the refrigeration unit; (c) appearance of the dispensers; (d) appearance of the juice; (e) agitation; (f) general operational efficiency; and (g) quality of the structural materials. Chemical, microbiologic, and organoleptic tests were conducted over a four-day period, to make possible an evaluation of the dispensers on the basis of maintenance of juice quality during operation. Maximum quality will be maintained if the juice is not held longer than 24 hr. Ascorbic acid retention after one day ranged from 94 to 97 per cent; at the end of four days, it was from 84 to 91 per cent. No clarification or separation occurred in any of the juices. Recommendations for proper care and use of citrus juice dispensers of this type conclude the article.

RESTAURANT MANAGEMENT

Vol. 70, June, 1952

*Pin-pointing your profits. Harris, Kerr, Forster, and Company.—p. 58.

Vol. 70, July, 1952

* New trends in food.—p. 13.
* Tying in with sandwich time. A. Easton.—p. 35.
Sandwiches as between-meal snacks. M. L. Casteen.—p. 46.
* Modern miracles with wheat. P. P. Logan.—p. 50.
* Pin-pointing your profits. Harris, Kerr, Forster, and Company.—p. 54.

Vol. 71, August, 1952

* Where restaurant students "learn it by doing it." Z. A. Berry.—p. 33.
Catering to September appetites. A. Easton.—p. 36.
* Pin-pointing your profits. Harris, Kerr, Forster, and Company.—p. 40.
Modern miracles with grain. P. P. Logan.—p. 44.

Pin-Pointing Profits. "More volume!" has been the need of a medium-sized Midwestern restaurant offering table service. Conventional table d'hôte menus, in addition to a wide à la carte selection, had been the management's policy until mid-1951 when it was decided to feature specialty foods and combination meals. Poultry was selected as the major food for specialization, because of its relative stability in price and supply and its better value price-wise than other meats. Advertising and promotion were used extensively to herald the change. As a result, seat turnover was speeded up. Labor cost was kept low through a careful study of the business pattern and by staggering employees' hours to conform to it.

New Trends in Food. Hot weather is hard on chickens, which have no "built-in" way to keep cool. University of California scientists have learned how to keep hens comfortable in the heat, by turning a fog-spray on them which wets them slightly. When the water evaporates, some of their body heat is removed.

Sandwiches. "Two slices of bread with a filling in between"—the dictionary's definition of a sandwich—may have applied when the Earl of Sandwich gave his name to the dish. However, today the word "sandwich" may mean anything from a bite-size tea or cocktail tidbit to the Dagwood concoction limited in height only by the size of a teen-ager's mouth. Factors contributing to the "big business" in sandwiches today are: the large number of industrial workers who carry their lunches; short lunch hours necessitating a rush through the noon meal; economic reasons; and, newest of all, television, which has popularized the take-home meal. Sandwich recipes are given in this article, as are suggestions for making, serving, and pricing sandwiches. The author warns that with sandwiches having grown to a main-meal status, the filling should be protein-rich food equivalent to a serving of meat, fish, poultry, cheese, or eggs.

Wheat. Cereal grains have supplied basic food for most of mankind since the Stone Age when people ate roasted or parched grains and made heavy unleavened bread by grinding grain with smooth stones. In this article, the four groups of wheats are classified, and the composition of the wheat kernel is tabulated. The milling process is described in detail. Other features include the discussion of gluten's role in making bread, and brief notes on the making of macaroni, premixes, and breakfast cereals. The per capita consumption of wheat flour in the U.S. (except for semolina) has declined since 1914. This decline is due at least in part to the vast improvement in the production, storage, transportation, and marketing of perishable goods, particularly fruits and vegetables.

Profitable Operation. Profit and loss figures are given for a Pacific Coast restaurant specializing in unusual menu items. Statistics would seem to indicate that the operation is making a negligible profit. However, this reasoning would be short-sighted as the restaurant is comparatively new and a considerable part of its expense is incurred in its effort to gain an outstanding reputation. Expensive specialty foods have increased the cost of sales but have done much to build this reputation and attract an increasing customer volume.

Students Learn by Doing. "Practice makes perfect" is the principle on which advanced quantity cookery and catering classes at the University of Illinois are trained. Every other week, students prepare and serve a dinner at "The Spice Box," their campus restaurant, and ten times each semester the restaurant is opened to customers. The jobs of manager, headwaiter, chef, baker, and pastry manager are rotated. Students are encouraged to emphasize less common foods and the preparation of common foods in unusual ways.

Pin-Pointing Profits. A small southwestern hotel's coffee shop and its profits are analyzed—the eighth case study in this series. All the food sales are concentrated in the shop, except for a small amount derived from room service. Although the salary and wage scale is higher than those of other restaurants in the area, the over-all ratio of payroll to the sales dollar is somewhat lower. The restaurant specializes in "chicken in the rough," and in a "loss leader," sirloin steak. This shop's profits may be used as a guide for other popular-priced coffee shop operators.

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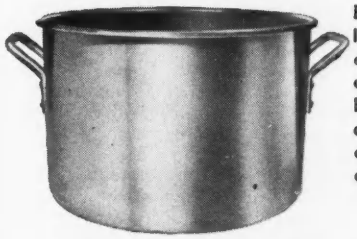

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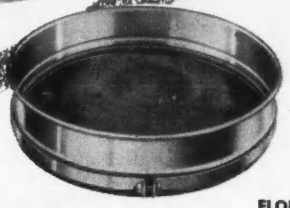

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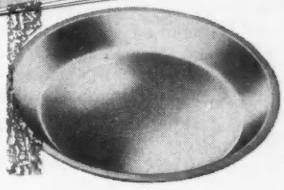

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WEAR-EVER ALUMINUM TRADE MARK REG. U.S. PAT. OFF.

Standard of Quality for more than 50 years

The Aluminum Cooking Utensil Company
1310 Wear-Ever Bldg., New Kensington, Pa.

Please send me a copy of your new catalog of utensils and equipment for restaurant and institution kitchens.

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TITLE.....

(Fill in, clip to your letterhead, and mail today)

MAIL TODAY

News Notes

Civil Defense Registration. The American Dietetic Association is one of the many national organizations asked to cooperate with the Federal Civil Defense Administration in registering volunteer workers.

A special nationwide campaign for registering women to participate in the Civil Defense Program has been announced for November 11 through 27. The dates mark the period between the patriotic and devotional observances of Armistice Day and Thanksgiving.

Because Civil Defense will use more women volunteers than men, the registration is designed particularly for women. At this time it will be simply a voluntary indication of willingness to be enrolled at a later date for specific service. Of the 17 million trained volunteers needed, more than 10 million women must serve.

Whatever her skills, every woman will be a vital team member trained to protect the country. The value of the dietitian in such an undertaking is readily apparent.

For your convenience in registering, you will find a coupon on page 984 in this issue of the JOURNAL. By sending it to your state dietetic association president, you pledge your willingness to be enrolled at a later date by your local Civil Defense Director for assignment to the service for which you are best fitted. Association members who register will be counted in the total numbers reported at the end of the campaign. This is your opportunity to volunteer your readiness to serve with Civil Defense in your community.

Further details are to be found in the Federal Civil Defense Administration booklet, "Women in Civil Defense," which may be obtained through local Civil Defense offices.

Winners of the Second Annual A.D.A. Photographic Contest. First prize in the Second Annual A.D.A. Photographic Contest was awarded to a photograph titled, "Dietetic Intern Makes Friends with a Young Patient." It was submitted by Irene Willson, Director, Dietary Department, Shadyside Hospital, Pittsburgh. The photograph will be reproduced in the November issue of the JOURNAL.

Another dietetic intern is featured in the second prize photograph, which shows the intern during her pediatrics affiliation feeding a little girl. Mary C. Zahasky, University of Oklahoma Hospitals, Oklahoma City, is responsible for entering the picture in the contest.

Third prize goes to Barnes Hospital, St. Louis, for a photograph taken on the ward floor with the medical team—doctor, nurse, and dietitian—in consultation.

Honorable mention awards were divided among the following entrants: Barnes Hospital; Martha E. Brown, Aetna Life Insurance Company Cafeterias, Hartford, Connecticut; Joe Engels, New York *Herald-Tribune:* Rosjoan K. Holdin, St. Louis; Neola Northam, Children's Memorial Hospital, Chicago; Bessie B. West, Head, Department of Institution Management, Kansas State College, Manhattan; Irene Willson; and Mary Zahasky.

Caribbean Conference. A conference on Home Economics and Education in Nutrition was held at Port of Spain, Trinidad, June 30 to July 5, under the joint sponsorship of the Caribbean Commission and the Food and Agriculture Organization. The purpose of the conference was to promote an exchange of information and experience on problems in this field, exploring ways in which member countries may be of mutual assistance and obtaining advice on how the sponsoring agencies might be of greatest service in promoting programs of home economics and nutrition in the area. Dr. Lydia J. Roberts, University of Puerto Rico, Chief, U. S. delegation, was elected Chairman of the conference.

The conference considered the extent and type of work offered in the field of family life education in the Caribbean area, the problems encountered, and ways by which more effective programs can be promoted. Attention was centered on education in family betterment through Extension, through the schools, including the school feeding programs, and through health, social welfare, and voluntary organizations. The need for cooperation among these agencies was stressed, and special emphasis was given to the need for more and better trained workers in the field.

Workshop in Homemaking Education. A.D.A. members participated as consultants to and members of a Workshop in Homemaking Education, held at the University of Vermont, Burlington, July 7 through 25, and sponsored by the Vermont Department of Education.

Aims of the workshop were (a) to present recent findings and information in the subject-matter areas of food and nutrition and other phases of home economics; (b) to introduce new techniques of teaching; and (c) to give help on individual teaching problems. The group planned activities to meet its needs, including setting of objectives for units in special areas; discussion of special problems in each area; making of scope and sequence charts; methods of teaching these units in a family-centered program; standards for various grade levels; evaluation methods; summarizing and outlining of teaching units; and examination and production of various teaching aids.

Government Course in Food Cost Control. From September 13 through 20, the Graduate School of the U. S. Department of Agriculture, Washington, conducted, for the first time, a course in food cost control. The subject matter included recipe standardization, portion control, daily food cost control, storeroom and purchasing records, equipment records, and labor costs. Instructor for the course was Capt. Louise A. K. Frolich, WMSC, Chief, Training Branch, Food Service Division, Walter Reed Army Hospital, Washington.

Study of Physical Impairments. The Committee on Mortality of the Society of Actuaries is making a study of physical impairments—the first major statistical study of medical impairments made since before World War II and probably the largest actuarial study of its kind ever undertaken. The Committee is a professional organization made up of more than a thousand actuaries in the U. S. and Canada.

The study will cover primarily the experience under life insurance policies issued between 1935 and 1949, traced through 1950. Included will be 132 groups of impairments and medical histories, further subdivided so as to comprise almost 400 classes of impairments. Policyholders of companies representing three-fourths of all life insurance in the U. S. and Canada will be covered; i.e., nearly a million entries.

Results will be presented in such a way as to relate the deaths among policyholders with impairments as recorded in the applications for policies when purchased, to what the deaths would have been had the applicants been normal risks. Among the more important groups of impairments being investigated are diabetes, albuminuria, glycosuria, family history of cardiovascular-renal disease, personal history of tuberculosis, heart disorders including rheumatic fever, arthritis, gastric and duodenal ulcers, and gall bladder disorders.

Findings are expected to permit conclusions to be drawn as to the mortality experienced in recent years for a wide variety of medical impairments. It is known that the general mortality level has changed radically in the past fifteen years, and it is believed that mortality among persons with different medical impairments has been affected in varying degrees. Probably, in the case of impairments coming under treatment by newly discovered methods, the mortality experience has improved markedly, but where relatively little progress in treatment has been made, the impairments have shown little change. The new study should produce facts on this.

GREAT CANNED PINEAPPLE INDUSTRY AD DRIVE

BOOSTS POPULAR APPEAL OF

MENUS WITH THAT Pineapple FLAVOR!

This double-page, full-color spread in Oct. 20 LIFE starts huge, year-round Pineapple advertising campaign in 13 national magazines, Sunday newspaper supplements

INCREASINGLY from now on, you'll find that Pineapple and Pineapple Juice . . . with Nature's most *refreshing* flavor . . . get a bigger-than-ever welcome at mealtimes 'round the clock!

Because Canned Pineapple is now being advertised dramatically in a long list of national magazines . . . advertised to over 40,000,000 American families in one of the greatest food-selling campaigns in U.S. history!

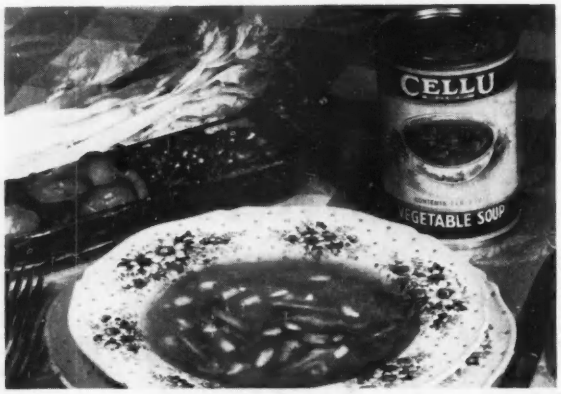
Remember this big Pineapple Industry ad drive when you plan menus and servings. Make more of your salads and main-course servings extra tempting with Pineapple. Feature Pineapple desserts for dinner and luncheons, and Pineapple Juice at breakfast!

For refreshing menu variety at any meal, add Pineapple...

NATURE'S MOST REFRESHING FLAVOR!

CELLU

A House Devoted to the Study of Dietetics



CELLU CHILI SAUCE

To make meals more tasty. Made without sugar, from fresh, ripe tomatoes, salt and seasonings. In 11 oz. bottles.

Send for
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Tangy Treats for
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CELLU VEGETABLE SOUP—Made with celery, cabbage, string beans, tomatoes, beef extract, onion, salt and water. In No. 2 cans.

CELLU VEGETABLE RELISH—Made with celery, cabbage, green pepper, onion, salt, vinegar, spices (no sugar). In 8 oz. jars.

CELLU CUCUMBER PICKLES—Also made without sugar, yet a tasty addition to the diet. In 6 oz. jars.

PURPOSEFULLY PREPARED
CELLU *Dietary Foods*
CHICAGO DIETETIC SUPPLY HOUSE *Inc.*
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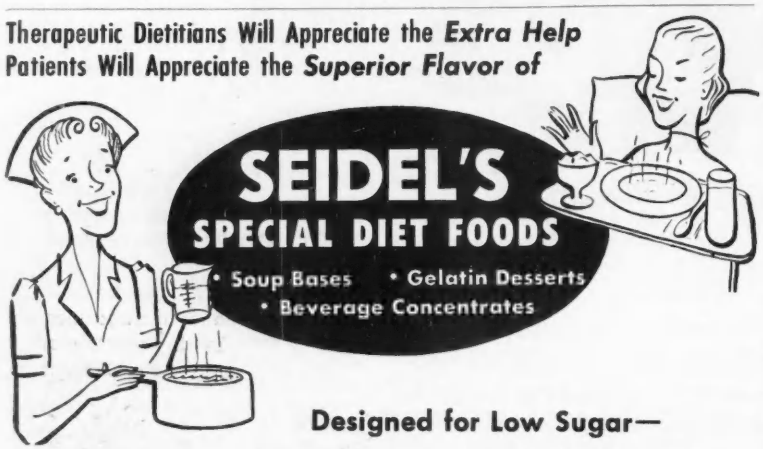
Therapeutic Dietitians Will Appreciate the *Extra Help*
Patients Will Appreciate the *Superior Flavor* of



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Low Calorie and Diabetic Diets

Developed in consultation with dietitians from many leading hospitals and chemists from Abbott Laboratories—Seidel's Special Diet Foods contain Sucaryl Calcium*, the new sweetening agent that is thirty times sweeter than sugar and *does not have any disagreeable after taste.* Taste panel tests show marked preference by patients for these new special foods over anything presently on the market. Moreover, heating in any degree does not injure their palatability. All products are very simple to prepare for serving and will save much effort. Packed in convenient jars and bottles for use as needed. Copy of Analysis by Independent Laboratory showing low Sodium and other content available on request. Price list and samples on request.

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University of Cincinnati Appointment. Eleanor R. Maclay on July 1 became Acting Dean of the University of Cincinnati College of Home Economics, to serve until a permanent dean is approved. She was named to this post following the resignation of Elizabeth Dyer, former Dean. Miss Maclay has been Head, Department of Food and Nutrition, for a number of years and has been active in the work of the local Public Health Federation and social service agencies, aiding with food and nutrition problems.

Dr. Carter Honored. Dr. Fred G. Carter, Director of St. Luke's Hospital, Cleveland, and a member of the A.D.A. Advisory Board, this year was named recipient of the annual Award of Merit of the American Hospital Association. The award, which was presented in Philadelphia on September 18 at the Association's convention, was based on Dr. Carter's many contributions in the hospital field.

WMSC News. Seventy Army reserve dietitians from the Women's Medical Specialist Corps will be recalled to active military service beginning in February 1953. The announcement was made by Anna M. Rosenberg, Assistant Secretary of Defense for Manpower. Fifty per cent will be recalled in February, 25 per cent in March, and 25 per cent in April. This is the first involuntary recall of women reservists in the Army's medical branches since early in the Korean campaign and is needed to replace women about to be released from active duty. Mrs. Rosenberg stated that women medical specialists will be screened to assure that no one essential to the national health, safety, and interest will be obliged to leave her civilian job. Those who have been recalled since June 25, 1950 will not be affected by this recall. Quotas have been established for each of the six continental Army areas based on numbers of reservists in those areas. These quotas are: 18 dietitians from the 1st Army Area; 12 from the 2nd; 4 from the 3rd; 5 from the 4th; 20 from the 5th; and 11 from the 6th.

Plentiful Foods. The following foods are expected by the U.S.D.A. to be in plentiful supply during October:

Protein foods

Fish, fresh and frozen	Milk—nonfat dry solids
Hens, stewing	Turkeys

Other foods

Grapes, table	Shortening, vegetable, and table fats
Honey	
Lard	
Raisins	Vegetables, locally grown
Salad oils	

Omicron Nu Adds New Chapters. During the academic year 1951–52, Omicron Nu increased its membership by four new chapters: Alpha Mu, University of Rhode Island; Alpha Nu, Alabama Polytechnic Institute; Alpha Xi, Carnegie Institute of Technology; and Alpha Omicron, West Virginia Uni-

Completely New! ....THIS HIGH SPEED, HIGHLY EFFICIENT, SANITARY

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STAINLESS STEEL STEAM JACKETED

Model "D" Tilting Kettle

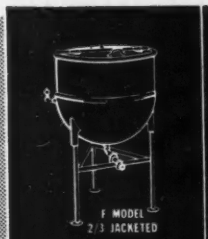
LOOK INTO THIS, MR. DEALER!

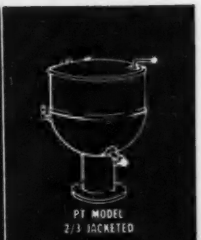
Model D, shown here, will be among the GROEN Stainless Steel Steam Jacketed Kettles on display in BOOTHS O and N at the NATIONAL HOTEL SHOW, GRAND CENTRAL PALACE, NEW YORK, NOV. 10–14. By all means see it! It's got everything! Redesigned from top to bottom. Stainless Steel inside and out. It's faster, lower, easier to work at. Smooth in operation. Self-locking, quick-acting worm and gear tilting mechanism stops at any point. Easy to pour . . . note the ample non-drip spout. Complete sanitary construction . . . COMPLIES WITH THE MOST RIGID HEALTH DEPT. CODES. A truly fine, typically GROEN-built unit. See it . . . handle it . . . at the Show. Or write us for Bulletin R-56. GROEN MFG. CO., 4549 W. Armitage Ave., Chicago 39, Ill.; 30 Church St., New York 7; 7 Front St., San Francisco 11.

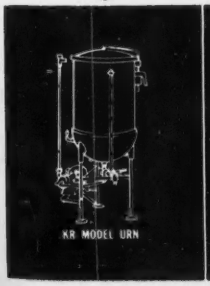
See us at the
NATIONAL HOTEL SHOW
Nov. 10–14
GRAND CENTRAL PALACE
New York Booths O and N

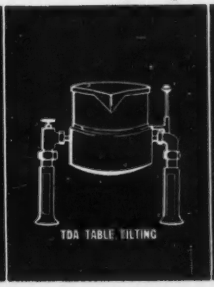
GROEN

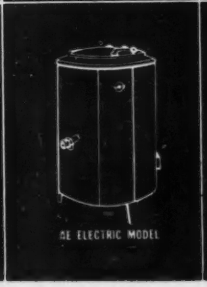
Half a Century of Fine Kettles











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Model 1440 enamel dial, price $10.00

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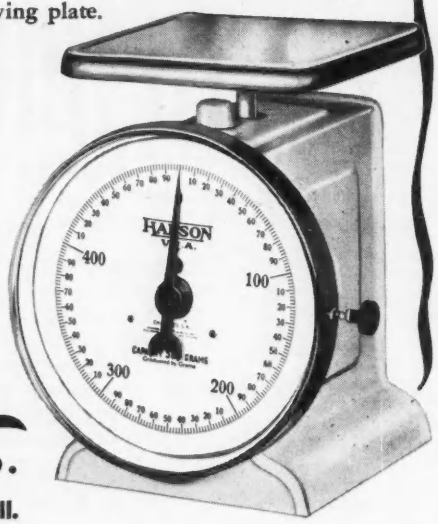

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A Fruit and Vegetable Buying Guide for Consumers has been released by the Fruit and Vegetable Branch, Production and Marketing Administration, U.S.D.A., as Home and Garden Bulletin No. 21. The bulletin, formerly Miscellaneous Publication No. 167, was prepared for the purpose of pointing out factors of quality in fruits and vegetables to the consumer. This, the authors state, is especially important in these times when many good-quality fresh fruits and vegetables are available year-round. Supermarkets encourage the housewife to make her own choice of foods and at the same time emphasize price appeal, so that a knowledge of fruits and vegetables is a necessity for economy. Sections are presented on general considerations and hints, and specific hints on buying 25 fruits, 46 vegetables, and 7 types of melons. Also included are tables listing the shipping seasons for fruits and vegetables and a table giving the main market season, characteristics, and use of different commercial varieties of apples. This handy sixty-one-page booklet may be obtained from the Government Printing Office, Washington 25, for 15 cents.

Nursing Appointments. Following the formation of the National League for

Downyflake

FULLY PREPARED BAKING MIXES

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For a third of a century, one after another, America's finest institutions have been joining the Downyflake ranks. And for good reasons, too! Tests quickly proved to them that, in addition to the wonderful "just add water-mix-and bake" economy and convenience . . . the quality of their finished baked goods compared favorably with home baked.

With Downyflake Prepared Baking Mixes, even unskilled help can bake perfect Gingerbread, Corn Muffins, Bran Muffins and Hot Rolls.

Skillful blending and the best ingredients money can buy gives Downyflake the superb texture and flavor that adds a taste-thrill to meals . . . sparks appetites

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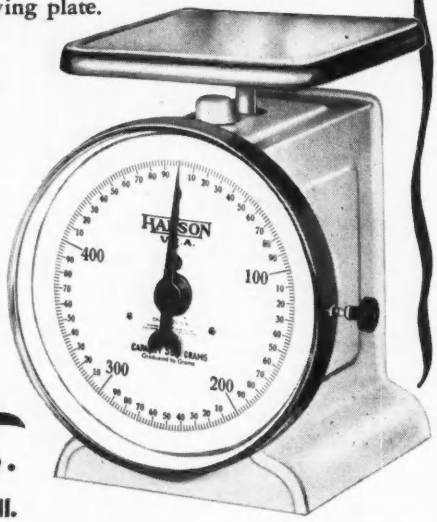

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Firm Name .....

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It's RIGHT
and Everyone likes
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For hard-to-please, scanty morning appetites, consider Maltex Cereal. Maltex is a *light* hot cereal—sits light as a feather on the stomach, is easily and quickly digested. Yet Maltex is *right*—a salt-free food enormously rich in food value . . . a natural source of protein, carbohydrate, minerals and vitamin B_1. And everybody loves the good toasted wheat and malted barley flavor. Maltex is economical, too—about a cent a serving. Cooks quickly, no lumping. Your supplier has Maltex. Just try it!

Write today for "Recipes for Serving 100 People" developed by our Home Economics Department in the Maltex Test Kitchens.

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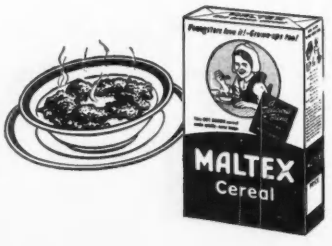

Nursing in June, Anna Fillmore, R.N., has been named General Director. The new organization was formed to replace the Association of Collegiate Schools of Nursing, National League of Nursing Education, and the National Organization for Public Health Nursing.

Announcement has also been made of the appointment of Julia M. Miller, R.N., as Director, Division of Nursing Education. Miss Miller formerly was Executive Director of the National League of Nursing Education. Other departments of this new organization with their heads include: Department of Diploma and Associate Degree Programs—Kathryn W. Cafferty, R.N., Director; Department of Baccalaureate and Higher Degree Programs—Helen Nahm, R.N., Ph.D., Director. These latter two departments will carry on, with other activities, the programs of the former National League of Nursing Education and the Association of Collegiate Schools of Nursing.

The Director of the Department of Public Health Nursing will be Ruth Fisher, R.N.

The new organization has offices at 2 Park Avenue, New York 16.

New Nursing Publication. *Nursing Outlook*, a new monthly magazine for the nursing profession, will have January 1953 as its first issue date. This magazine has been designated as the official monthly publication of the National League for Nursing. Objectives of the editorial content of *Nursing Outlook* will be: (a) to assist public health and industrial nurses to render improved services to parents and children, the chronically ill and handicapped, and industrial workers; (b) to aid educators in advancing existing educational programs with special emphasis on the training of potential administrators, teachers, and consultants; and (c) to serve as a guide for hospital administrators and supervisors in improving the application of nursing skills to the advantage of patients and communities.

Public Health Nursing will discontinue publication with the advent of *Nursing Outlook*, as its current functions will be incorporated in the new publication.

United Nations Day. October 24 marks the world's only international holiday—United Nations Day. The theme for this year is: "Celebrate United Nations Day by Sending Gifts and Greetings World Wide!—Through UN Birthday Parties-With-A-Purpose."

Diabetes Week. Diabetes Week, sponsored by the American Diabetes Association from November 16 through 22, will mark the opening of the 1952 Diabetes Detection Drive. This year there will be an intensive nationwide effort to discover an estimated million undetected cases of diabetes.

Meeting. Women's Medical Specialist Corps officers, physicians, dentists, nurses, and other medical personnel of the armed services may earn reserve credit points for attendance at the daily sessions of the 59th annual meeting of the Association of Military Surgeons, the Department of Defense has announced. The meeting will be held in Washington, D. C., November 17 through 19.

Interns Graduate. Diplomas were presented to eight dietetic interns at *Indiana University Medical Center*, Indianapolis, on August 29. The graduates are: Arlyn Buder, Michigan State College; Anne Fabina, Mount Mercy College, Pittsburgh; Delpha Foster, The Ohio State University; Elizabeth Hooper, University of Tennessee; Lois Keck, University of Alabama; Gladys Lehti, Purdue University; Ruth Olney, University of New Hampshire; and Doris Sarvis, Alabama Polytechnic Institute.

Pins and diplomas were awarded on August 31 to the eleventh graduating class of dietetic interns at the *Stanford University Hospital*, Stanford, California. Dr. William H. Northway, Superintendent of the hospital and a Professor of Medicine at Stanford University, addressed the group. Members of the class include: Arden Johnson, Evangeline Kimball, Naomi Mueller, Eunice Pratt, Sarah Roberts, Marian Sanford, Norma Tada, and Betty U'Ren.

Seven dietetic interns have recently completed their work at the *Ancker Hospital*, St. Paul, Minnesota. They are: Alice M. Anderson, North Dakota Agricultural College; Lois Harrer, MacMurray College, Jacksonville, Illinois; Garifallia Kourounis, Charokopios School of Home Economics, Athens, Greece, and Fenn College, Cleveland; Melba Mack, Idaho State College; Betty Ann McKee, University of Wisconsin; and Mary Lou Schuttler and Dorothy Swanson, both of Iowa State College.

Army Recruits Practical Nurses. The Army Medical Service will open two new forty-eight-week courses for men and women medical technicians to become practical nurses, beginning October 27. The courses will be conducted at Letterman Army Hospital, San Francisco, and Fitzsimons Army Hospital, Denver, and will be known as the advanced medical technician procedure course.

Ethel M. Flower. The A.D.A. office has been notified of the death on August 11 of Ethel Morrison Flower in Hancock, Michigan. Mrs. Flower, a native of Calumet, Michigan, had been an A.D.A. member since 1937. At the time of her death she was employed by Manor Hospital, Chicago. She had also been on the dietary staffs of: American Legion Hospital and Battle Creek Sanitarium, both in Battle Creek, Michigan: Michigan State College, East Lansing; and Bronson Methodist Hospital, Kalamazoo, Michigan.

E. Marion Oliver. Word has been received in the A.D.A. office of the death of E. Marion Oliver on August 7. Miss Oliver, a graduate of State Teachers College, Framingham, Massachusetts, had been Therapeutic Dietitian at Cambridge City Hospital, Cambridge, Massachusetts, for twenty years and had been a member of the Association since 1936.

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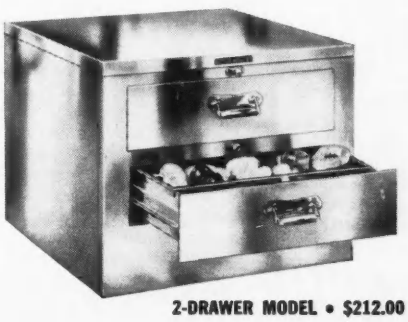

2-DRAWER MODEL • $212.00

Yes, you speed service and cut serving costs with the "Toastmaster" Roll and Food Warmer because you can cook a wide variety of foods ahead in quantity for later serving. Actually, foods stay hot and oven-fresh for hours, maintaining their original color and appearance. Since foods are always ready, serving time is shortened. Placing this equipment in floor diet kitchen service eliminates long trips to the kitchen, saves steps for serving personnel.

You get payroll savings, too, when you cook ahead in quantity. Large-portion cooking requires less kitchen help than when smaller portions are prepared individually. Also, by serving directly from a "Toastmaster" Roll and Food Warmer placed in floor diet kitchens, fewer people can serve more patients.

You'll be delighted with the way hard rolls stay crisp . . . vegetables retain their tempting flavor . . . meats, fish and fowl stay brown on the outside, tender on the inside. The "Toastmaster" Roll and Food Warmer makes it easy to increase menu variety, too.

Automatic temperature control plus six-side drawer construction keeps foods from drying out. Adjustable dampers permit individual humidity control in each drawer. Sealed drawer construction stops odor transfer. A plug-in appliance—no steam or hot water connections—no installation expense.

Your food service equipment dealer is ready to show you how the "Toastmaster"* Roll and Food Warmer keeps foods hot and oven-fresh for hours, speeds service, and cuts serving costs as well.

TOASTMASTER

Roll and Food Warmers

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Mary Katherine Smith. Notification has been received of the death of Mary Katherine Smith on July 11 in Columbus, Ohio. Miss Smith, a graduate of Ohio Wesleyan University, took her internship at the University of Michigan Hospital and became an A.D.A. member in 1942. She had been on the staff of Miami Valley Hospital, Dayton, and was Home Economics Instructor at Thomas A. Edison Junior High School, Marion, Ohio, at the time of her death.

Julia Jean Wallace. Word has come of the death of Julia Jean Wallace at her home in Dubuque, Iowa, on August 19. Miss Wallace, an A.D.A. member since 1944, was on leave of absence from the staff of Vanderbilt University Hospital, Nashville, Tennessee, where she was Therapeutic Dietitian. She had also held positions on the staffs of: Mercy Hospital, Chicago; Oak Ridge Hospital, Oak Ridge, Tennessee; and St. Thomas Hospital, Nashville.

Children's Diets. American children's diets have improved over the years, owing to better economic conditions and more widespread nutritional knowledge, according to the Bureau of Human Nutrition and Home Economics, U.S.D.A. However, the Bureau's nutritionists, emphasize that the U. S. is far from the goal of a good diet for every child.

Inadequacy in children's diets is most likely to be caused by insufficient calcium, ascorbic acid, and/or vitamin A. A review of dietary studies made during the past decade or so indicate that children of high school age tend to have poorer diets than younger children, and girls poorer diets than boys, even when they are in the same family. Adolescent girls have the poorest diets of all. Studies also show that children of low-income families are more likely than others to have inadequate meals.

Keeping Bread Fresh. Housewives with home freezer space have no problem of keeping bread fresh and mold-free, states Philip Talbott, Production and Marketing Administration, U.S.D.A. Mr. Talbott reports a study made by the American Institute of Baking under the Research and Marketing Act, which showed that bread should be kept either frozen or warm to retain softness. Frozen bread which is stored well below freezing temperature will keep fresh about a year, but this is an uneconomic use of freezer space and requires special moisture-vapor-proof wrapping to prevent drying out. For keeping bread in the freezer from one to two weeks, the waxed-paper wrapping in which it is sold is enough.

Bread should be left in the wrapper until it thaws out, so that moisture from the warm air will condense on the wrapper rather than the bread. However ready-sliced loaves need not be thawed for toasting because the frozen slices are easily separated and can be put right in the toaster.

Keeping bread in the refrigerator is a question of the housewife's preference. Studies show that bread in the refrigerator loses the softness which means freshness to many people, nor can it be restored to this original softness. Some consumers, however, like the firmer texture of day-old or older bread—"stale" bread to the trade.

Molding is a different problem from "staling," and the housewife must consider mold, especially in summer, if she does not keep her bread frozen or her family does not use the entire loaf promptly. Bread is safer from mold in the refrigerator than in a breadbox, particularly in hot weather, if it must be kept several days. If bread is to be kept in a breadbox, the container should be kept clean, free of old bread fragments, and well-aired with occasional scalding and sunning. The breadbox should also be thoroughly dry before putting bread into it, if mold is to be avoided.

News of State Associations

California Dietetic Association. The *San Diego Section* of the California Dietetic Association met in May to hear Dr. Alvin Leonard, Assistant Director, City and County Health Department of San Diego, discuss "Nutrition and Aging." Salient points of his talk were: the lower basal rate, the lower caloric requirements, the interference with cholesterol metabolism, the tendency to a negative calcium balance, and the changed metabolic possibilities found in aging persons. Also emphasized was the increased need for protein; Dr. Leonard recom-

MODEL MK "PANHANDLER"

YES—now you can machine-wash and rinse all types of pots, roasting pans, steam table pans, kettles and utensils —even 80-quart mixing bowls.

No more slow, old-fashioned soaking and scraping. This *new* A-F Model MK "Panhandler" — with automatic wash timer — uses the powerful A-F Super-Spray pressure system which removes even the most obstinate residues from pots and pans — in one washing!

You'll be amazed by the compactness of the A-F Model MK — its surprisingly low cost, its efficiency — and the way it lowers your kitchen costs and quickly pays for itself!

Occupies Floor Space of Only 3'-4" x 4'-8"—Can be furnished for gas, steam or electric heating.

Lower Your Kitchen Costs!

Write for New, Free Model MK Folder Today

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241 Disney St. *Established 1901* Cincinnati 9, Ohio

Also Engineers and Manufacturers of A-F Pan and Rack Washers for Bakeries

Karo

IDEAL
CARBOHYDRATE
FOOD

right thru life!

. . . in the infant feeding formula

Karo® Syrup has been prescribed by physicians for over 30 years . . . as an ideal milk modifier. Well tolerated and readily digested, Karo is completely absorbed and utilized.

. . . on family menus, some way, every day

Youngsters and active people of all ages enjoy Karo as a delicious sweetener and ideal source of quick food energy. Karo is especially popular as a pour-on for pancakes.

. . . in the diet of the senior citizen

A high carbohydrate diet (up to 60%) favors the normal aged. Karo, added to milk, cereals or fruits, offers an ideal way to supply a portion of the daily carbohydrate needs.

KARO *is a complete carbohydrate . . .*

a balanced mixture of dextrins, maltose, dextrose.

MEDICAL DIVISION

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mended 1½ to 2 gm. per kilogram per day. New officers for the San Diego Section are: Chairman, Harriet Grunow, La Jolla; Chairman-Elect, Margaret Berry, Scripps Metabolic Clinic, La Jolla; and Secretary-Treasurer, Beulah Gordon, San Diego County Hospital.

Members of the *San Jose Section* held a dinner meeting on May 28 near Palo Alto, at which four students from San Jose College were special guests. The following officers have been elected for 1952–53: Chairman, Mildred Thom Mancini, VA Hospital, Palo Alto; Vice-Chairman, Kathleen Weber, Sequoia Hospital, Redwood City; and Secretary, Edith Wood Dunlap, Community Hospital, San Mateo.

The *Santa Barbara Section's* final meeting of the year included the election of the following officers: Chairman, Esther Uhlman, Santa Barbara Cottage Hospital; Vice-Chairman, Madeline Wiseman, Devereux Ranch School, Goleta; and Secretary-Treasurer, Betty Rankin, Santa Barbara General Hospital.

Indiana Dietetic Association. Vitamins formed the theme of an exhibit sponsored by the Indiana Dietetic Association at the Indiana State Fair, August 28 through September 6. Three groups of white rats were exhibited: one group had been given a normal diet, one group had received a diet deficient in the B-complex, and one group had eaten a diet causing hypervitaminosis A. The public, most of whom were unaware of the possibility of hypervitaminoses with dangerous effects, were most interested in the last group. On the backdrop of the exhibit, vitamins A and D, ascorbic acid, and the B vitamins, and the chief sources of each, were listed.

Ohio Dietetic Association. The Diet Therapy Section of the *Dayton Dietetic Association* has initiated a project offering dietetic assistance to rest homes and small hospitals in Dayton. Officers for 1952–53 of the Dayton Association are: President, Lois Koblitz Ittelson, Dayton Department of Health; President-Elect, Jeanne Tucker Coleman; Vice-President, Dorothy Glazer; Secretary, Maurine Penry Britt, Miami Valley Hospital; and Treasurer, Mary Ann Mahlmeister, Farm Security Administration, Chillicothe.

West Virginia Dietetic Association. Officers of the West Virginia Dietetic Association for 1952–53 are as follows: President, Cleo Margaret Gray, Marshall College, Huntington; President-Elect, Eloise S. Cofer, Agricultural Extension Service, West Virginia University, Morgantown; Secretary, Evelyn White Clark, VA Hospital, Huntington; and Treasurer, Betty Jo Sullivan, Pennsboro.

Wisconsin Dietetic Association. Twelve past presidents of the Wisconsin Dietetic Association were honored in April by presentation of A.D.A. gold pins. The presentation was made at the pre-convention board meeting held at the University of Wisconsin, Madison.

News of Advertisers and Exhibitors

Elsie Stark, Director of Consumer Education, *Best Foods, Inc.*, New York City, has recently been elected the first woman member of the Board of Directors of the Medical Exhibitors Association, Inc. This organization is national, with a membership of more than two hundred companies which exhibit at conventions in the medical, hospital, and allied fields. Miss Stark has been active in the organization since 1935.

Edward Don & Company announces that it is now distributing a new plastic towel named "Wizard" which is made of the non-woven plastic-rayon fabric. Wizard towels can be used for cleaning, washing, drying, polishing, and dusting, and can also be used for filtering greases and liquids. The towels are 18 by 24 in., packed in bundles of fifty, and come in white or assorted colors.

The *American Dry Milk Institute, Inc.*, has prepared a color, sound, slide film titled "Cooking with Nonfat Dry Milk Solids." Included in the slides are pictures of a milk drying plant, explanation of the physical and nutritive properties of nonfat dry milk solids, and suggestions for using them in cooking and baking. The film is 35 mm. and is available for ten-day free loans or for sale at a price

a complete line without a break...
in 7 colors
POWDER BLUE
GOLDEN YELLOW
SEA FOAM GREEN
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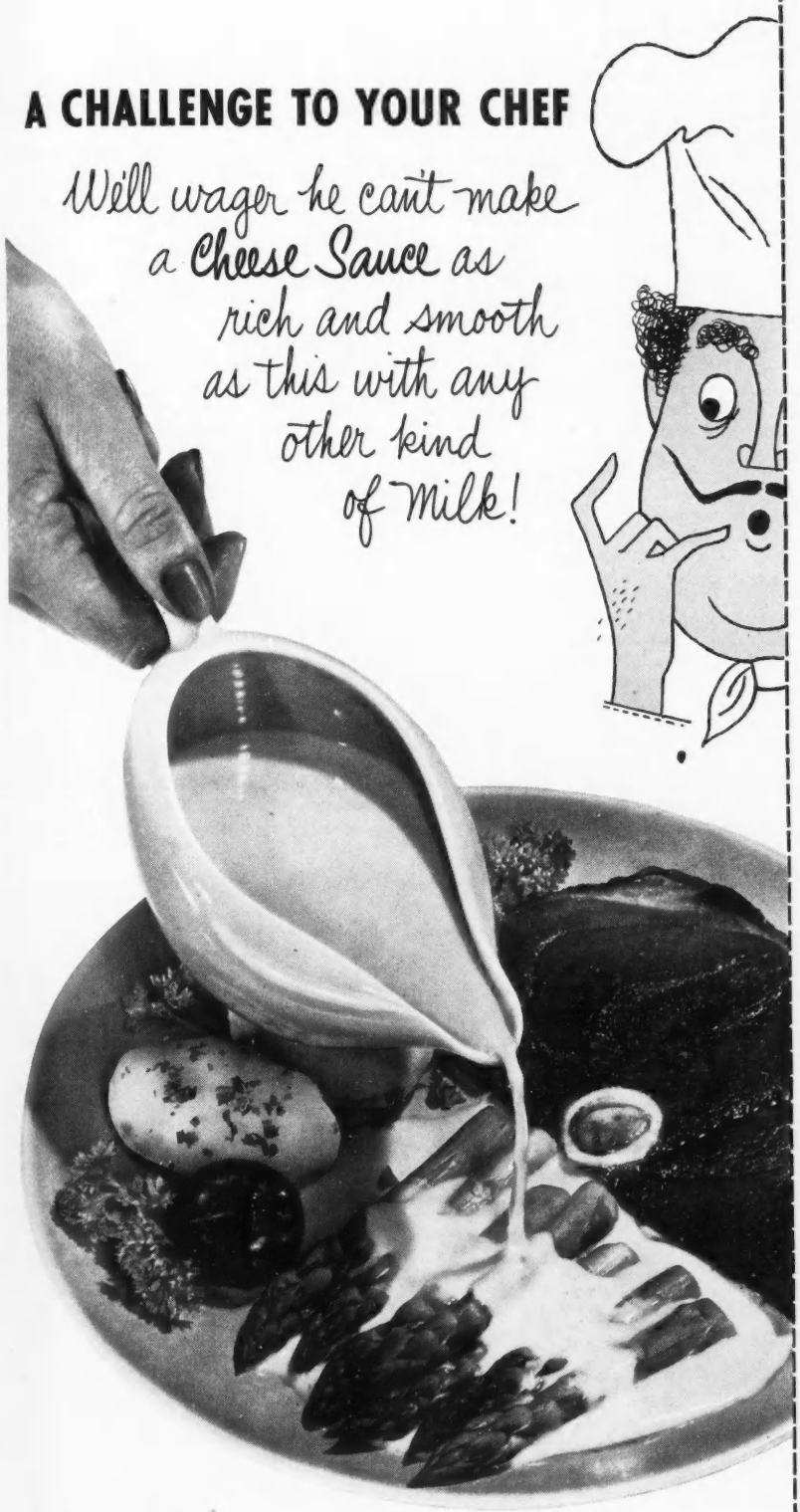
FOREST GREEN
CRANBERRY RED
Dinnerware that is practically unbreakable... in seven solid colors that are unbeatable... that's BOONTONWARE.
Colors that range from spring-like pastels to deep, dramatic tones. Colors that mix or match in seemingly endless combinations. Imagine the possibilities they offer to decorate dining hall and serving tray; to enhance food servings.
Write today for your free descriptive color folder. It displays the entire BOONTONWARE line. It also gives you sizes, capacities and identification numbers. Best of all, it gives you the colors themselves to consider, compare, and match. Requesting this folder does not obligate you in any way.
Request Your Free Color Folder Today
Boontonware complies with CS 173-50, the heavy-duty melamine dinnerware specification as developed by the trade and issued by U. S. Department of Commerce, and conforms with the simplified practice recommendations of the American Hospital Association.
See your regular Supply House or write to us for the name of your nearest Dealer.
Boontonware
fine dinnerware fashioned of MELMAC®
BOONTON MOLDING COMPANY, Boonton, New Jersey

A CHALLENGE TO YOUR CHEF

We'll wager he can't make a Cheese Sauce as rich and smooth as this with any other kind of Milk!



Carnation Performs Cooking Miracles Not Possible With Any Other Form of Milk

It Takes Carnation Evaporated Milk

—No Other Form of Milk Will Do!

We hope your chef will accept our challenge. For we sincerely believe he'll be amazed when he tries this Carnation cheese sauce recipe.

In many instances (we think *most* instances), Carnation gives better cooking results. And in some cases—this cheese sauce, for example—it produces results *just not possible with any other form of milk.*

You see, Carnation is *concentrated* milk...concentrated to twice the richness of ordinary milk. And Carnation is specially *heat-refined*...so it blends more smoothly with other ingredients, bringing out more of their flavor.

Now, we're not suggesting you order a *case* of Carnation and try to change your chef's life-time habits overnight. Not yet, anyway! All we'd like you to do is buy *one single can*...then give it to your chef along with this ad.

Fair enough?

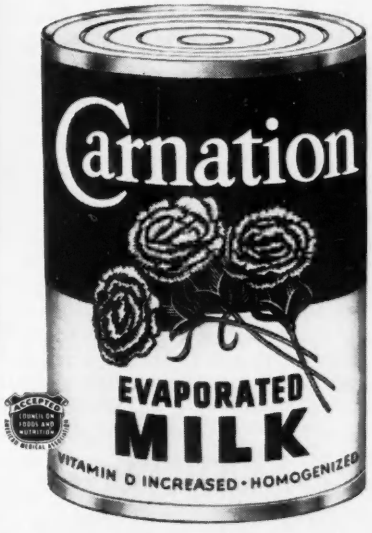
Carnation Cheese Sauce

(Makes about 2½ cups sauce)

1⅔ cups (large can) undiluted Carnation
½ teaspoon salt
1 cup (4 oz.) cubed or grated process-type American cheese

Combine Carnation and salt in saucepan over low heat. Heat until small bubbles appear around edges of pan (about 2 minutes). Add cheese and keep sauce over heat about 1 minute, or until the cheese melts. Stir occasionally. Pour over cooked vegetables and serve at once.

P.S. If you want quantity recipes, please drop us a line. Carnation Co., Dept. C-102, Los Angeles 36, Calif.



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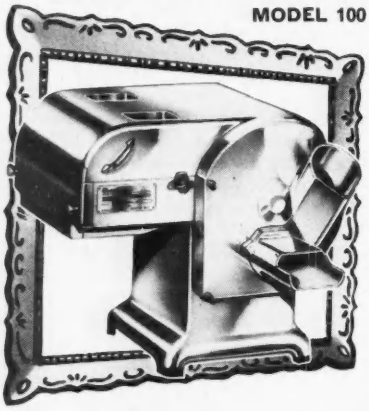

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You'll agree that the Electro-Cut is truly an amazing machine . . . ONE WHICH YOUR INSTITUTION CAN NOT AFFORD TO BE WITHOUT DURING THE PRESENT LABOR CRISIS. Saves time, saves help; makes slices and slaws, rough and line choppings, French fries, Juliennes . . . all look and taste more tempting.

Series 300 Vegetables Slicer

Your servings will be far more enticing and your service will be more efficient with the series 300.... Does any French knife cutting operation . . . only *faster*. Enables the special trims and extras which look so attractive.

Potato Salad Dicer

Here's low cost magic for commercial kitchens... Two quick motions make the most perfect dicing of cooked potatoes for salad you've ever seen. Use on legs as shown or with clamps on any pan.

Price.....Only $34.50

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1210 RACINE STREET

RACINE, WISCONSIN

of $25. A printed, illustrated booklet of narration accompanies the film.

Ad. Seidel and Son has added a new line of dietetic foods containing sucaryl calcium (Abbott Cyclamate). Seidel is the first food manufacturer to use this product. These new food products are designed for diabetic diets and also for low-sodium, low-sugar, and low-calorie diets. They are also low in carbohydrate and protein. The line includes soup bases, gelatin desserts, and beverage concentrates are available.

American Can Company this summer sent a specially chartered ship, the S.S. *Alaskan*, to Hawaii to bring back tinplate urgently needed in manufacturing cans to pack the West Coast's highly perishable fruits and vegetables. The tinplate is supplementing stocks depleted by the steel strike. The principal fruit and vegetable items which can be packed in cans made from this type of tinplate are peaches, pears, tomato products, and fruit cocktail.

American Can Company's new Stockton, California plant was officially opened July 10. The plant, with a rated production capacity of 350 million containers a year, was built to meet the growing needs of the packing industry of the Delta and San Joaquin Valleys.

Ruth Baker has joined the Nutrition Service of the *Ralston Purina Company* as assistant to Elspeth Bennett, Manager. The company is installing a new test kitchen in which some of Miss Baker's work will take place. Her other activities will include publicity, professional convention activities, and developing some of the dietary publications of the Nutrition Service. Before coming to the Ralston Purina Company, Miss Baker was Home Economist and Nutritionist for *Mead Johnson & Company*, Evansville, Indiana, and also had been Home Economist for *Fearn Foods, Inc.*, Franklin Park, Illinois.

Universal Dishwashing Machinery Co. has announced a new type of heavy duty, immersion type dishwashing machine. Designated as the Model TA, it is a three tank immersion unit, to operate in either direction without any changes. Each tank is deep, designed for full immersion operation. The center tank is the power wash tank. Either end tank, depending on direction of operation, can be used for pre-soak, pre-rinse, or for the final rinse tank. The Model TA is equipped with two swing faucets and two manually operated flexible hose sprays. The sprays can be used for pre-washing or for final rinsing in each tank, depending on the direction of the operation of the machine. A sliding metal drain board offers convenient working space on top of the machine. Pre-washing in the deep end tank is done without splash of water on the operator. An easily removable perforated scrapper basket catches all food particles for convenient disposal. Each tank can be equipped with gas, electric, or steam heating equipment, also thermostats and thermometers for registering and controlling water temperature. No booster is required for the final rinse. The machine is 67 in. long, 24 ¼ in. wide, and 44 in. high, including the 5-in. height of the swing faucets.

Army Announcements Concerning Dietetic Personnel

The following dietitians have received initial appointments in the Women's Medical Specialist Corps and are on active military duty:

1st Lt. Lelia B. Dickinson, R-20150
1st Lt. Mary E. Wilkinson, R-2637

The following dietitians have been promoted:

First Lieutenant to Captain
Louise B. Harrison, R-923

Second Lieutenants to Temporary First Lieutenants

Eunice M. Axtell, R-2352
Gloria S. E. Beck, R-2600
Gwendolyn E. Dupree, R-2598
Doris Fredrickson, R-2578

The following were selected for the 1952–53 dietetic internships offered by the Department of the Army and appointed in the grade of second lieutenants:

Brooke Army Hospital, Fort Sam Houston, Texas

Barbara A. Bargen
Ruth E. Damon
Mary M. Diggs
Mary Louise Fisk
Luz Elia Gutierrez
Patricia E. Mooney
Dora A. Powell
Ruthie M. Randolph
Patricia Sayre

Walter Reed Army Hospital, Washington, D. C.

Patricia L. Accountius
Eileen R. Clark
Dolores Cooley
Barbara T. Godfrey
Carolyn S. Henderson
Elizabeth Holenweg
Emma O. Jones
Marilyn L. Kuebler
Joann M. Morletti
Marilyn F. Richardson
Jewelene Traylor

The following dietitians have been relieved from active military duty:

Capt. Norma H. Blocker, R-1342
Capt. Loretta A. Jacobson, R-1341
1st Lt. Louise C. Zambrano, R-1088
1st Lt. Florence M. Matty, R-2565
1st Lt. Vera E. Kerstell, R-274
1st Lt. Alice E. Featherstone, R-1385
1st Lt. Dorothy L. Jett, R-2576
1st Lt. Margaret H. Kolze, R-2546

First Lieutenant Rosemary O. Brown, R-10101, has been honorably discharged from the Women's Medical Specialist Corps, Regular Army.